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An investigation of the pragmatic implementation of weekend rehabilitation services in Australia

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Abstract

With an ageing population, health services are striving to increase efficiency without negatively impacting patient care. Implementing weekend allied health rehabilitation therapy services could assist with this. Randomised controlled trials have demonstrated the efficacy of weekend rehabilitation services, showing improved functional independence and quality of life, a possible reduction in length of stay, and likely cost effectiveness. However, weekend rehabilitation service models have mainly been investigated in publicly funded hospitals, with limited research of their effectiveness or implementation in real world contexts. Weekend rehabilitation services in Australia were last surveyed in 2011. Since then, the publication of several studies may have influenced weekend rehabilitation therapy provision. It is therefore timely to explore the current status of Australian weekend rehabilitation service provision. Clinician perspectives on service implementation are also important to understand, as clinicians are key influencers of the development of new services. This thesis aimed to investigate current Australian rehabilitation weekend therapy provision; the effectiveness of different service delivery models on functional independence, length of stay, patient outcomes, and staff perspectives, and the implementation costs of weekend service provision in a real world setting.

To address these aims, a pilot and five studies were conducted. A pilot survey (Chapter 3) of senior physiotherapists in purposively selected inpatient rehabilitation units in Australia (n=36) was conducted to investigate the feasibility of providing a weekend therapy service in the rehabilitation setting, and inform the service design for implementing this service at a private metropolitan rehabilitation unit. Most responding facilities (63%) provided a

weekend service, most commonly as a half-day, Saturday physiotherapy service, in privately funded, metropolitan facilities. These findings suggested that it was feasible to trial a Saturday physiotherapy service in a private rehabilitation service.

Studies 1, 2 and 5 of this thesis investigated the effectiveness of implementing different models of a 6-day rehabilitation service in a private mixed rehabilitation unit using a 20-week prospective cohort study design with a historical control. Study 1 (Chapter 4) compared 6-day physiotherapy service provision with usual 5-day services. Patients receiving 6-day physiotherapy achieved greater functional independence and better balance compared to those receiving 5-day physiotherapy, with a trend towards a shorter length of stay by 1.7 days (95%CI -3.92 to 0.53).

Study 2 (Chapter 5) investigated the impact of staff currency of practice on 6-day rehabilitation physiotherapy service provision. Weekend services were either provided by rehabilitation staff or acute ward staff. More patients attended Saturday therapy sessions, were in Saturday therapy for longer, and achieved greater functional improvements with rehabilitation staffing compared with acute. There was no difference in gait or balance outcomes, with a trend towards a shorter length of stay by 1.5 days (95%CI -4.4 to 1.3) with rehabilitation staffing. Outcomes were also evaluated by diagnosis; patients with orthopaedic diagnoses achieved greater change in functional independence, while patients with reconditioning or neurological diagnoses demonstrated a trend towards a reduction in length of stay by four days with rehabilitation staffing.

Study 3 (Chapter 6) is a formative evaluation of rehabilitation staff perspectives of the implementation of a 6-day physiotherapy service at three time points; pre-implementation (Study 1), post-implementation (Study 1), and following modification (Study 2). Staff were surveyed regarding barriers, facilitators, improvements and the perceived impact of the 6-day physiotherapy service on length of stay and patient goal attainment. Initially, all staff identified barriers, which focused mainly on staffing and patient selection. Following service implementation and modification, only 30% of staff suggested service improvements, mainly regarding efficiencies and expansion. Prior to implementation of the 6-day service, staff were unsure of the impact on length of stay and goal attainment. However, following implementation and modification of the service, staff perceived a positive effect on both length of stay and goal attainment.

Study 4 (Chapter 7) presents a survey of Australian rehabilitation units to determine current allied health weekend rehabilitation service provision and identify senior clinician perspectives of barriers and facilitators of weekend service provision. Eighty-three percent (n=179) of units responded, with 57% providing a weekend service, the majority providing a 6-day physiotherapy service. Barriers and facilitators to providing a weekend service were focused on budget, staff availability and support.

Finally, Study 5 (Chapter 8) compared a physiotherapy-only service to a multidisciplinary (physiotherapy, occupational therapy and allied health assistant) 6-day service. More

patients attended the weekend service, received more Saturday therapy sessions and spent more time in Saturday therapy with multidisciplinary compared to physiotherapy-only staffing. Patients receiving multidisciplinary 6-day therapy had a shorter length of stay by 3.5 days (95%CI 1.33 to 5.67) compared to those receiving 6-day physiotherapy. Cost-minimisation analysis revealed that the multidisciplinary 6-day service resulted in cost savings for the hospital of over $280,000 over twenty-weeks compared to 6-day physiotherapy service.

Through these studies, current rehabilitation weekend service delivery, clinician perspectives and the effectiveness of different weekend service provision models have been explored. This thesis recommends a 6-day physiotherapy and occupational therapy service with staff experienced or currently working in rehabilitation be provided in Australian rehabilitation facilities to help address the current issues facing health services with the increased ageing population.

Declaration by author

This thesis is composed of my original work, and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly-authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical assistance, survey design, data analysis, significant technical procedures, professional editorial advice, financial support and any other original research work used or reported in my thesis. The content of my thesis is the result of work I have carried out since the commencement of my higher degree by research candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree or diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted to qualify for another award.

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Publications during candidature

Peer-reviewed publications

Caruana, E. L., Kuys, S. S., Clarke, J. and Brauer, S. G. (2017). A pragmatic implementation of a 6-day physiotherapy service in a mixed inpatient rehabilitation unit. *Disability & Rehabilitation*, 39(17): 1738-1743.

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Caruana, E. L., Kuys, S. S., Clarke, J. and Brauer, S. G. (2018). The impact of staffing model in a 6-day rehabilitation physiotherapy service. *Physiotherapy Research International*, 23(2): e1701.

Caruana, E. L., Kuys, S. S. and Brauer, S. G. (2018). Allied health weekend service provision in Australian rehabilitation units. *Australasian Journal on Ageing, 32*(2), E42-48.

Conference abstract publications

Caruana, E., Kuys, S. S., Clarke, J. and Brauer, S. G. (2015). Weekend therapy service provision in a sample of rehabilitation facilities throughout Australia. *Physiotherapy,* 101(Supplement 1): e200 - e201.

Conference presentations

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Caruana, E. L., Kuys, S. S., Clarke, J. and Brauer, S. G. *'Weekend therapy service provision in a sample of rehabilitation facilities throughout Australia',* World Confederation of Physical Therapy Congress, 2015, Singapore: poster presentation.

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Caruana, E. L. (Candidate)	Conception and design (50%) Analysis and interpretation (70%) Drafting and production (60%)
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Contributions by others to the thesis

The PhD candidate was primarily involved in reviewing the literature, development of study design, completion of ethics applications, recruitment of participants to surveys, data collection and analysis, and manuscript and thesis preparation for the pilot study and studies 1 to 5. The candidate was also primarily involved in dissemination of research at local, national and international conferences.

This PhD could not have been completed without the significant guidance and contribution from my supervisors Professor Sandra Brauer and Professor Suzanne Kuys. They were involved in study design, data analysis, review of drafts for manuscript submissions and thesis development and review of conference presentations. They also assisted with funding applications to enable Study 5 completion.

Jane Clarke assisted in the study conception and design for the Pilot Study, and Studies 1-3, as well as data analysis and review of draft manuscripts.

Dr David Rowell assisted in the economic analysis and review of manuscript drafts for Study 5.

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Research Involving Human or Animal Subjects

Ethical approval was obtained from two sources. The University of Queensland Medical Research Ethics Committee (reference number: 2014000752) and School of Health and Rehabilitation Sciences Ethical Review Committee endorsed by the Human Experimentation Ethical Review Committee (reference number: 2015SHRSPHTY001), and the Uniting Care Health Human Research Ethics Committee (reference number: 2011.16.38). Please see Appendix 1 for copies of approval letters.

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List of abbreviations used in the thesis

10MWT	10 Meter Walk Test
ADL	Activities of Daily Living
AROC	Australasian Rehabilitation Outcome Centre
BOOMER	Balance Outcome Measure for Elder Rehabilitation
cm	Centimetre
CI	Confidence interval
FIM	Functional Independence Measure
FR	Functional Reach
FTE	Full time equivalent
FTEC	Feet Together Eyes Closed
LOS	Length of Stay
m/s	Meters per second
N	Neurological diagnosis
n	Number
O	Orthopaedic diagnosis
PEDro	Physiotherapy Evidence Database
QOL	Quality of Life
R	Reconditioning diagnosis
RCT	Randomised Controlled Trial
s	seconds
SD	Standard deviation
SPSS	Statistical Package for the Social Sciences
TUG	Timed Up and Go Test
USA	United States of America

Chapter 1 – Introduction

1.1 Introduction

Faced with an ageing population and increasing rehabilitation admissions, hospital rehabilitation services are looking for opportunities to increase efficiencies that reduce costs and increase services provided, without negatively impacting patient care. One method to increase efficiency is to increase therapy services provided. Increasing patient physiotherapy time by 19 minutes per day can reduce length of stay (LOS) and increase quality of life (QOL) in both acute and rehabilitation patients (Peiris, Taylor, & Shields, 2011). Increasing other therapy services such as occupational therapy has received little investigation, although similar improvements have been noted (Slade, Tennant, & Chamberlain, 2002). Several methods to increase therapy service delivery have been investigated, however this thesis focuses on one method that is not routinely performed in Australian rehabilitation units, providing weekend therapy services.

Weekend physiotherapy services are well established in the acute hospital setting. The aims of these services are often to manage acute exacerbations of cardiorespiratory conditions, meet early post-surgical protocols and prevent deterioration in acutely unwell patients. Services are typically provided only to the most urgent cases with a significantly reduced workforce to minimise the added costs of overtime due to weekend work. A 6- or 7-day service has been shown to improve patient progression, reduce deterioration (McAuley, 1999), and facilitate earlier discharges (Heck, Newton, & Chan, 2001), without limiting the progression of patients admitted later in the week (Pua, Ong, Chong, & Lo, 2011). Acute orthopaedic and neurological patients have demonstrated reductions in LOS with weekend physiotherapy services (Hughes, Kuffner, & Dean, 1993; Pua et al., 2011; Rapoport & Judd-

VanEerd, 1989) without negatively impacting function, discharge outcomes or adverse events (Lang, 1998; Pua et al., 2011). Cardiac patients have also demonstrated faster achievement of functional outcomes with weekend physiotherapy, with these patients also reporting a preference for weekend therapy over weekday alone (van der Peijl et al., 2004). There has been far less research investigating the impact of a weekend service in the rehabilitation setting. While patients attend rehabilitation services for a wide variety of reasons, the main reasons for admission are to provide multidisciplinary rehabilitation, including a greater intensity (dose) of therapy than could be provided as an outpatient to make functional gains, or to improve function to a level that ensures a safe discharge to the determined destination (e.g. home with community support). Patients attending rehabilitation tend to be older, and usually have greater impairments or barriers to discharge to overcome than those in the acute setting. Traditionally, rehabilitation services have been provided during working hours on weekdays, and weekend physiotherapy services have centred on acute patient needs. Chapter 2 will outline several approaches to improving dose of therapy, such as circuit classes and more independent patient practice. Weekend service delivery in rehabilitation is one approach that could substantially increase dose that needs to be investigated to determine whether weekend service delivery is effective at improving rehabilitation goals as the setting, population and goals in rehabilitation are different to the acute setting.

In 2011, a survey investigating weekend service provision in Australia (Shaw, Taylor, & Brusco, 2013) found that 61% of Australian hospitals provided a Saturday service, and 45% of hospitals provided a Sunday service. When comparing weekend service provision by

patient acuity, over 70% of acute hospitals provided a Saturday or Sunday service, whereas only 30% of rehabilitation hospitals provided a Saturday service, and 13% provided a Sunday service. These numbers appear lower than weekend service provision rates in Canada, where 97% of tertiary care hospitals provide weekend services (Campbell et al., 2010). However, this difference in service provision is greatest in rehabilitation. In the United States of America (USA), 87% of rehabilitation facilities provided some form of weekend service (Hooper & Dijkers, 1987). It is possible that fewer Australian rehabilitation facilities are implementing weekend therapy services due to the lack of research in this area showing a benefit.

There have recently been two randomised controlled trials (RCT) investigating the efficacy of weekend service provision in rehabilitation in Australia. These studies utilised two models of weekend service delivery - physiotherapy alone (Brusco, Shields, Taylor, & Paratz, 2007) and physiotherapy and occupational therapy (Peiris, Shields, Brusco, Watts, & Taylor, 2013). These studies found non-significant reductions in LOS by two (Peiris, Shields, et al., 2013) and 3.2 days (Brusco et al., 2007) as well as improvements in functional independence, QOL, and activity levels (Peiris, Shields, et al., 2013) with no increase in adverse events (Brusco et al., 2007; Peiris, Shields, et al., 2013; Peiris, Taylor, & Shields, 2012a). The physiotherapy and occupational therapy service is also likely to be cost effective at one and 12 months following implementation (Brusco, Watts, Shields, & Taylor, 2014, 2015).

A necessary next step in the translation of this evidence into practice is investigating the effectiveness of 6-day weekend therapy services in real world rehabilitation settings. One study has investigated a 6-day multidisciplinary (doctors, physiotherapy, occupational therapy, physiotherapy assistant and social work) weekend service in a pragmatic rehabilitation setting, finding a non-significant reduction in LOS by one day and increased Saturday admissions (Hakkennes, Lindner, & Reid, 2015). However, the 6-day implementation of physiotherapy services alone, or in conjunction with occupational therapy services (without other disciplines) have not been investigated. The pragmatic implementation of 7-day weekend services in rehabilitation has, however, received some investigation. A 7-day physiotherapy and occupational therapy service has been compared to a 5-day service (DiSotto-Monastero, Chen, Fisch, Donaghy, & Gomez, 2012) in a mixed rehabilitation setting in Canada, and a 7-day multidisciplinary (physiotherapy, occupational therapy and speech pathology) service compared to a 6-day service (Ruff, Yarnell, & Marinos, 1999) in people with stroke in the USA. Both studies found non-significant reductions in LOS of less than one day (DiSotto-Monastero et al., 2012; Ruff et al., 1999).

Neither service delivery model found a significant reduction in LOS. However, given that the RCTs mentioned above have investigated the efficacy of a 6-day rehabilitation service (Brusco et al., 2007; Peiris, Shields, et al., 2013), but not its effectiveness in a real world setting, the pragmatic implementation of a 6-day physiotherapy or physiotherapy and occupational therapy service requires investigation, and has been chosen for the basis of this thesis. Additionally, the pragmatic implementation of a 6-day compared to 5-day service model has not yet been investigated. Effectiveness studies allow clinicians to

determine how RCTs are implemented in real world contexts, where staffing models, patient populations, costs and time constraints may limit the translation of RCT protocols into rehabilitation facilities, potentially resulting in differing outcomes from the RCTs. The effect of a pragmatic 6-day service on patient outcomes, hospital systems and costs needs to be investigated, to assist in determining the most effective model of weekend service delivery in rehabilitation.

Given the results of recent literature, it is also pertinent to investigate current weekend rehabilitation service provision. One aspect of weekend service provision that has received little investigation is clinician perspectives. Exploring clinician perspectives is important as clinician support is vital in the implementation of new service initiatives (Melton & Hartline, 2010; Shee, Phillips, Hill, & Dodd, 2014). Gauging clinician perspectives may help identify barriers and facilitators, assess the acceptability and adoption of weekend service implementation and assist in optimising the model of weekend service delivery into rehabilitation facilities. Gaining a better understanding of clinician perspectives as well as barriers and facilitators to providing a weekend service may enable researchers to target potential barriers in future research endeavours, in order to facilitate the implementation of evidence-based practice.

The overall aim of this thesis is to investigate the effectiveness of weekend therapy in rehabilitation. In order to achieve this aim, this thesis presents a pilot and five studies utilising an effectiveness-implementation hybrid framework. To orient the reader to this

thesis, first, a background chapter (Chapter 2) is presented, which will further explore the growing need for efficiencies in physiotherapy and allied health service delivery in rehabilitation units in the face of an increasing ageing population. Several methods to increase efficiency will be explored, and the gaps in the current literature will be outlined, to provide a rationale for the studies presented in this thesis.

Then the studies will be presented, each in a separate chapter. First, a pilot study was undertaken to investigate weekend service provision in a sample of Australian rehabilitation facilities (Chapter 3). This was used to determine the feasibility of implementing weekend therapy in rehabilitation units and inform service design for implementing this service at a private metropolitan rehabilitation unit.

Studies 1, 2 and 5 (Chapters 4, 5 and 8) will investigate the effectiveness of a 6-day physiotherapy service in rehabilitation on LOS, functional independence and patient outcomes over 20-weeks. These studies take place in a private metropolitan rehabilitation facility with a mixed rehabilitation case load. These studies will investigate different weekend service models. Study 1 (Chapter 4) will investigate a 6-day physiotherapy service, providing four hours of physiotherapy on a Saturday in group and individual sessions. Study 2 (Chapter 5) will compare acute and rehabilitation staffing expertise in the provision of this four-hour Saturday service, as well as investigate the impact of this service on different diagnostic cohorts.

Study 3 (Chapter 6) is a formative evaluation study taking place alongside Studies 1 and 2. This study utilises a series of surveys investigating staff perspectives on acceptability, feasibility and adoption, and the impact of the service on LOS and functional goal attainment.

Study 4 (Chapter 7) will present the findings of a national survey of weekend service provision in Australian rehabilitation facilities. This study will report on adoption of weekend rehabilitation services in Australia and service provision methods. This survey also explored clinician perspectives, providing new insights into the acceptability of clinicians and barriers and facilitators to providing a weekend service.

Study 5 (Chapter 8) will compare the effectiveness of a 6-day multidisciplinary service (physiotherapy, occupational therapy and allied health assistant) with a 6-day physiotherapy service. A cost-minimisation analysis will be completed with the study, to identify implementation costs and determine if the benefits from implementing the service outweigh the cost of service provision.

The final chapter (Chapter 9) of this thesis presents a summary of the studies included in the thesis. The main discussion points and clinical implications will also be explored. Additionally, strengths and limitations of the studies in this thesis will be addressed, as well as future research directions.

Chapter 2 – Background and thesis aims

In the face of an ageing population, health services are striving to find efficiencies within their service to maximise service provision while minimising costs. Provision of a weekend service in rehabilitation is becoming more popular but with mixed results. This chapter will present the evidence for and against weekend therapy service provision in rehabilitation, as well as the reasoning behind the methods used in this thesis.

2.1 Background

2.1.1 The ageing population

It has well been established that the population is ageing, with the number of older adults in the world increasing dramatically (WHO, 2015). Figure 2-1 shows the proportion of the population by country aged 60 years and older, in 2015 (Figure 2-1a) and the projections for 2050 (Figure 2-1b). While in 2015 there was only one country with 30% or more of the population aged 60 years or older (Japan), this number is projected to significantly increase by 2050 across the world (WHO, 2015). In Australia, by 2050, the number of people aged 60 years or older is expected to double (The Treasury, 2010), growing to 25-29% of the total Australian population (WHO, 2015). In 2017, people aged 65 years and older comprised 15% of the population of Australia (AIHW, 2017b). Additionally, in 2017, the number of people aged 85 years and older made up 2% of the population (AIHW, 2017b). This age-group is growing at a faster rate than any other age bracket (AIHW, 2015). With this growing number of older people, increasing life expectancy (AIHW, 2017b), and advances in medical care and technology, a larger percentage of the population are at risk of developing diseases associated with ageing, leading to more older people with disability and limitations in activity participation (AIHW, 2015), and potentially requiring rehabilitation.

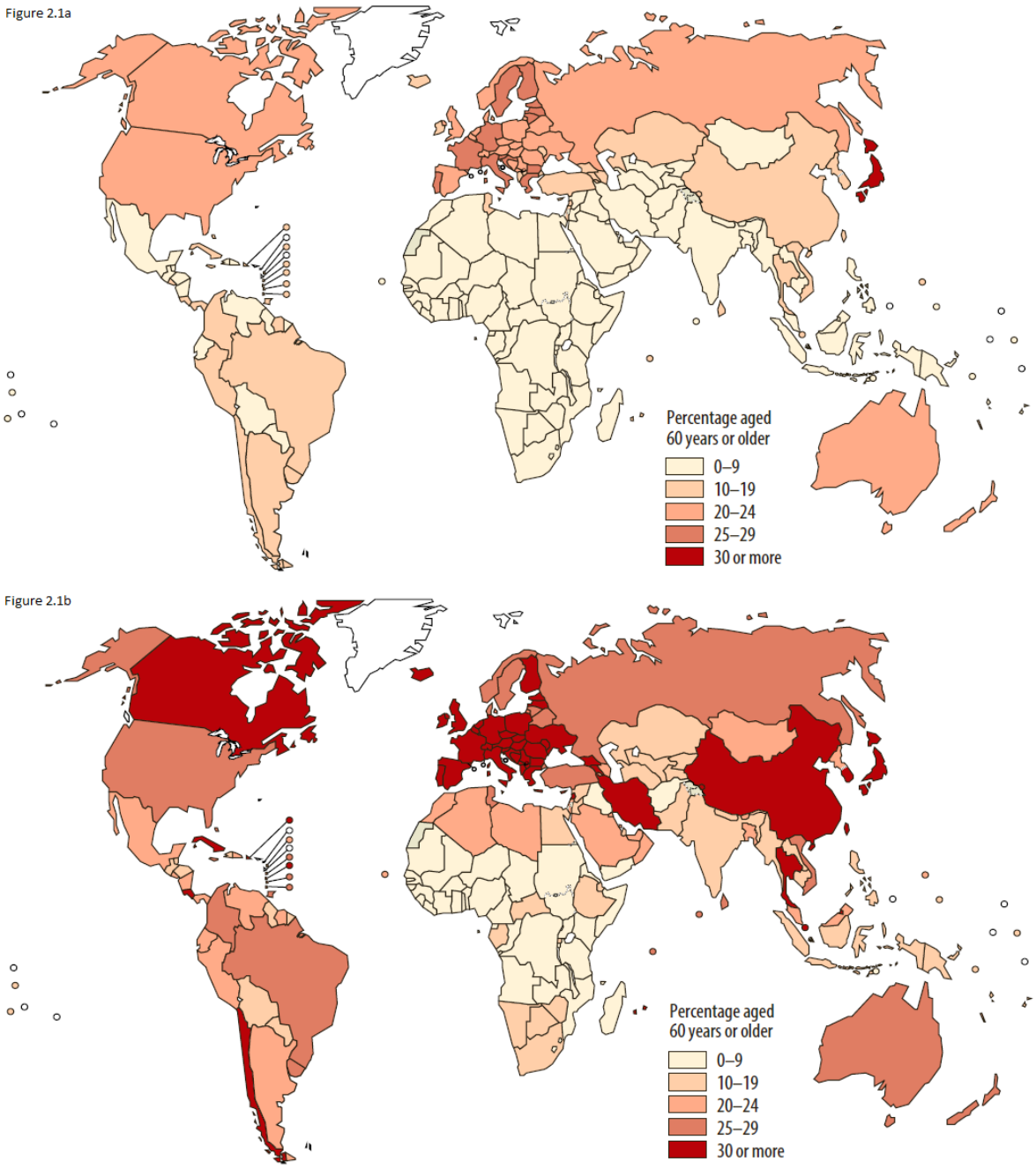

Figure 2-1: Proportion of population aged 60 years or older in a) 2015 and b) 2050 projections, by country, WHO (2015).

Worldwide, the populations with the highest rates of disability are those aged 60 years and older (WHO, 2011). In 2004, it was estimated that 46% of those aged 60 years and older had a moderate or severe disability (WHO, 2011). People in this age bracket with a disability were more common in lower- and middle-income countries compared to higher income

countries (WHO, 2011). In Australia in 2009, it was reported that 54% of older people had a disability of some form, with 20% requiring assistance with activities of daily living (ADL) (AIHW, 2013). Diseases associated with ageing may be contributing to this disability. Diseases that become more prevalent with increasing age include arthritis (which can result in the need for a costly joint replacement), osteoporosis (which can lead to fractures), cancer, cardiovascular disease (including coronary artery disease, hypertension, stroke), dementia, diabetes mellitus, kidney disease and obesity (ABS, 2012; AIHW, 2013). Eighty-seven percent of older people in Australia reported having one of these long-term health conditions in 2015 (ABS, 2016). Ageing also increases the likelihood that people will have more than one of these conditions (AIHW, 2013). In 2009, just under half of the population aged 65-74 years not in residential care (49%) had five or more of these conditions (AIHW, 2013). This number rose to 70% in people aged 85 years and older (AIHW, 2013). These diseases can lead to significant impacts on the individuals, their carers and the community, including medication, potential hospitalisation and reduced independence. Managing and treating people with these diseases, who may require rehabilitation, increases the burden on the health care system.

In 2014-15, people aged over 65 years old accounted for 41% of all hospitalisations in Australia (AIHW, 2016b). Between 2010-11 and 2014-15, the number of hospital admissions for people aged 65 years and older increased by approximately 6% per year (AIHW, 2016b). It is projected that by 2050, health spending will increase to seven times the current amount for people aged 65 years and over, and twelve times for those aged 85 years and older

(AIHW, 2013). Now, more than ever, cost effective solutions to managing the effects of diseases associated with ageing are required.

2.1.2 The need for rehabilitation

Due to the progressive and debilitative nature of these long-term health conditions, many elderly people require treatment in rehabilitation units. Rehabilitation, or rehabilitation care, uses a multidisciplinary team to deliver treatment aimed at improving the functional status of people with an impairment, activity limitation or participation restriction caused by a health condition (AIHW, 2016a). In 2014-15, rehabilitation accounted for nearly 80% of all subacute and non-acute hospital admissions in Australia (AIHW, 2016b). Furthermore, between 2014 and 2017, there has been a 13.5% increase in inpatient rehabilitation episodes (AROC, 2016a, 2018). The most common diagnoses treated in rehabilitation in 2017 were orthopaedic (elective joint replacements and fractures), reconditioning from illness or surgical procedure, and stroke (AROC, 2018) (see Figure 2-2), which align with the long-term illnesses associated with ageing.

In Australia, rehabilitation care can be provided in the public or private sectors with differences noted in the number and type of patients admitted between these sectors. Seventy-six percent of all rehabilitation admissions in Australia occur in private hospitals (AIHW, 2017a). From 2010-11 to 2014-15 there were approximately 12% more rehabilitation admissions per year in the private sector, compared to 4.4% per year in the public sector (AIHW, 2016b). In 2016, people aged over 60 years accounted for more than

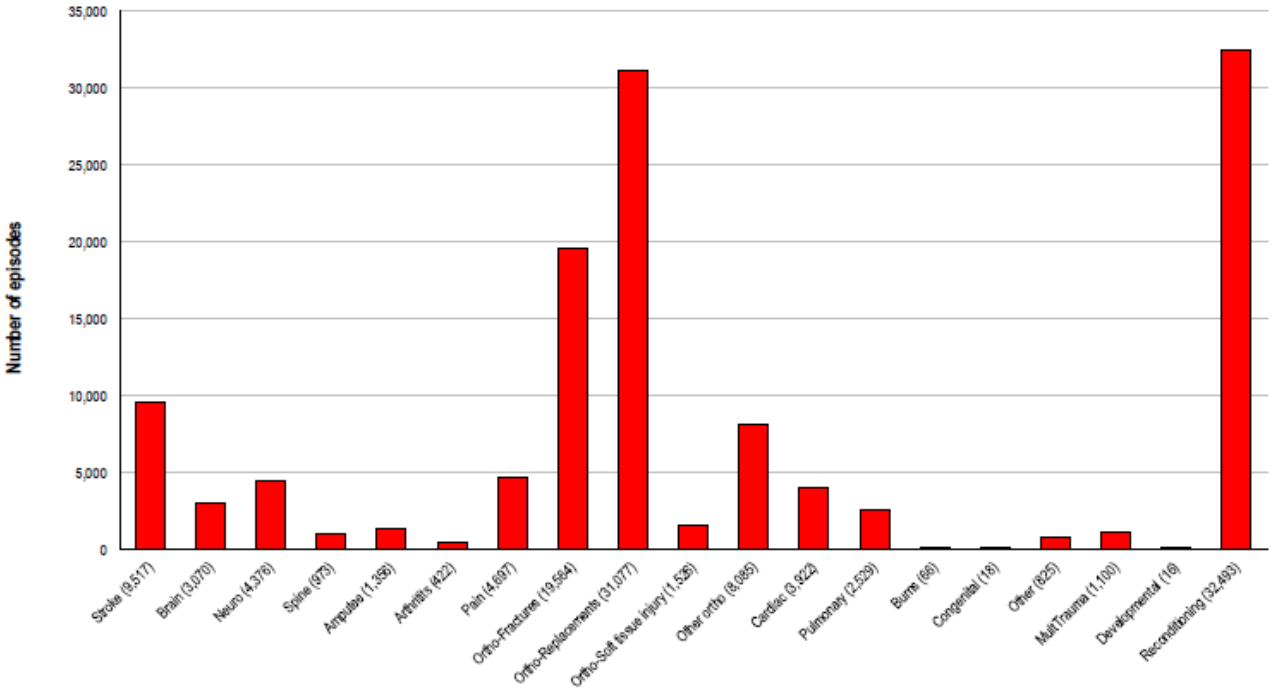

Figure 2-2: Number of episodes treated in rehabilitation by diagnostic category in Australia in 2017 (AROC, 2018).

80% of hospitalisations in rehabilitation (AIHW, 2017a). Although the diagnostic mix for rehabilitation was similar for both public and private hospitals, private hospitals showed higher numbers of elective orthopaedic joint replacements, while public hospitals had more admissions for reconditioning, orthopaedic fractures and stroke (AROC, 2018). As a result, it is possible that investigations of cost-effective solutions to hospital admissions in the ageing population completed in the public sector may not automatically translate to the private sector. Therefore, research needs to be completed in both sectors to determine the optimal solutions in each setting.

With the number of rehabilitation admissions increasing, it is pertinent to investigate the cost of rehabilitation. The national average cost per rehabilitation bed day in Australia has been estimated at $925 (IHPA, 2015). Average rehabilitation LOS (counted as the number of

days a patient stays overnight in a hospital (Peiris, Shields, et al., 2013)) is 17.8 days (AROC, 2016a). This gives an average cost of $16,465 per rehabilitation stay. In 2016, the number of episodes for rehabilitation increased by approximately 3% from the previous year, to 119,583 episodes for the year (AROC, 2016a). This brings an estimate of the total cost of rehabilitation to $1.9 billion in 2016 in Australia. This makes the cost of rehabilitation care a significant and growing issue.

The increasing number of people requiring inpatient rehabilitation, and the costs associated with a rehabilitation episode, places pressure on the hospital system to deliver the best outcomes with the most efficient use of resources. Improving efficiencies in rehabilitation services are required, especially within the private sector which has experienced a 12% increase in admissions over the last four years, compared to 4% in the public sector (AIHW, 2016b). Rehabilitation units are therefore striving to find methods that will reduce LOS, without adversely impacting patient outcomes. LOS is described as a major indicator of hospital performance, efficacy and patient resource usage (Holden & Daniele, 1987; Peiris et al., 2011). Reducing LOS should result in improved patient throughput and improved cost efficiency for hospitals (Brusco et al., 2007). One risk that may be associated with reducing hospital LOS is the possibility that the quality of care a patient receives may be impacted, or that costs may be transferred to other settings. However, it appears that reductions in LOS can occur without transferring costs to community care providers or resulting in increased readmission rates to hospitals (Harrison, Graff, Roos, & Brownell, 1995). More recently, patients have been shown to have been admitted to rehabilitation at lower functional levels but discharged at similar functional levels over a seven-year period, which has been

achieved with a 10 day reduction in LOS and greater efficiency in functional improvements (Kuys, Burgess, Fleming, Varghese, & McPhail, 2016).

2.1.3 The importance of physiotherapy in rehabilitation

One potential method of increasing the efficiency of hospitals and reducing LOS to manage this increased demand on hospitals by the ageing population, is by increasing physiotherapy services provided. Physiotherapy is a healthcare profession skilled in the assessment, diagnosis and treatment of movement disorders, disability and disease (APA, 2014; WCPT, 2016). Physiotherapists work with people to enable them to maximise QOL and functional ability, and achieve their goals after injury, disease, disorders or ageing (APA, 2014; WCPT, 2016). Physiotherapy is an important component in the overall management of hospital patients in Australia and is the most common allied health intervention in rehabilitation, accounting for 34% of all procedures in rehabilitation care throughout Australian hospitals in 2014-15 (AIHW, 2016a). As a result, intervention from physiotherapists for patients undergoing rehabilitation in hospital contributes to improvements in patient functional outcomes in fractured hip and stroke populations (Cameron, Lyle, & Quine, 1993; McNaughton, DeJong, Smout, Melvin, & Brandstater, 2005), reducing LOS in neurological, and orthopaedic populations (Brusco et al., 2007; Cameron et al., 1993; McNaughton et al., 2005; Slade et al., 2002), and reducing waiting lists (Peiris et al., 2011), as well as contributing to cost savings for the health system (Brusco et al., 2014; Peiris et al., 2011).

2.1.4 Increasing physiotherapy time

Level 1 evidence has suggested that increased time spent in physiotherapy is beneficial for hospital patients. A systematic review of 16 RCTs investigated the evidence of providing increased physiotherapy time to people with acute and subacute conditions in hospital (Peiris et al., 2011). The review found that extra physiotherapy reduced LOS by approximately one day in the acute setting, and four days in rehabilitation settings. In addition, patient outcomes were enhanced, with an increased rate of improvement of walking ability, activity and QOL found in those with acute and subacute conditions who received increased physiotherapy time. An extra 19 minutes of physiotherapy each day per patient was required to achieve these outcomes. A recent systematic review found that additional physiotherapy in subacute settings reduced LOS by three days in the general population, and by nine days in people with stroke (Peiris, Shields, Brusco, Watts, & Taylor, 2018). These findings support a previous systematic review investigating the effect of additional exercise time in people with stroke undergoing rehabilitation (Kwakkel et al., 2004). The majority of the studies included (17 out of 20) were conducted in subacute settings with people less than six months post stroke. An additional 16 hours of combined physiotherapy and occupational therapy per patient across the first six months post stroke has also been found to result in beneficial changes in ADLs, walking speed and dexterity (Kwakkel et al., 2004). Although in agreement with both earlier systematic reviews, another more recent systematic review found that the amount of extra rehabilitation therapy required was significantly greater than previously suggested (Schneider, Lannin, Ada, & Schmidt, 2016). A minimum of 240% of additional rehabilitation therapy in the stroke population is required to have an increased likelihood of an improvement in upper or lower

limb activity (AUC = 0.88, p = 0.04) (Schneider et al., 2016). Similarly, increasing the intensity of physiotherapy after hip fracture can reduce LOS and dependence (Kimmel, Liew, Sayer, & Holland, 2016).

While these reviews found that increased physiotherapy time reduced LOS and improved patient outcomes, it was not always specified as to how this extra physiotherapy time was provided. Methods to increase physiotherapy treatment time could include increasing the efficiency of current services, increasing the length or number of physiotherapy sessions on weekdays, or extending the hours that physiotherapy services are provided (Peiris et al., 2011), encouraging independent practice, and the use of therapy assistants. These methods will be discussed below.

2.1.4.1 Increasing the efficiency of physiotherapy treatment

Increasing the efficiency of current physiotherapy treatment could lead to patients receiving a greater dose of therapy (e.g. more repetitions of practice) in the same amount of time. Despite patients with stroke being in the physiotherapy gym to receive treatment for an average of approximately 50 minutes per day, almost 30% of this time is spent sitting or inactive (Kuys, Brauer, & Ada, 2006). This is supported by a systematic review, finding that stroke patients spent 40% of their therapy time inactive (Kaur, English, & Hillier, 2012). Although this inactivity is likely in part due to patients requiring/having rest breaks between exercises or waiting for the therapist (Kuys et al., 2006) it is imperative that strategies to increase time spent active in therapy are used to optimise dose and therefore efficiency of services. Several methods to increase efficiency of physiotherapy practice will be discussed

below including increasing activity during therapy sessions, increasing the number of patients treated each session, increasing the number of treatment sessions, encouraging independent practice and the use of therapy assistants.

2.1.4.1.1 Making patients more active

Ensuring patients are more active within therapy sessions is one strategy to increase the amount of therapy received. A systematic review found that people with stroke generally performed very few repetitions of upper limb exercises within therapy sessions in rehabilitation, with 32 repetitions across both physiotherapy and occupational therapy the maximum reported (Hayward & Brauer, 2015). High repetitions of task specific practice are required to achieve skill acquisition (Kleim & Jones, 2008), and retraining functional tasks is often the goal of rehabilitation. There is emerging evidence that people with stroke are capable of performing high repetitions of task practice, up to 300 repetitions of upper limb task-specific functional exercises within a one hour therapy session (Birkenmeier, Prager, & Lang, 2010; Waddell, Birkenmeier, Moore, Hornby, & Lang, 2014). Increasing this dose of practice has resulted in greater functional ability and activity participation than usual care (Birkenmeier et al., 2010; Waddell et al., 2014). This has also been seen in the lower limb with increased walking activity. Treadmill training can be used in stroke populations to increase the amount of walking completed in a session. People with stroke can perform up to 1000 steps when utilising treadmill training in a 20 minute session compared to the same time period with conventional physiotherapy, in which participants took 50-100 steps (Mehrholz, Thomas, & Elsner, 2017). This has been shown to result in improvements in

walking speed and endurance (Mehrholz et al., 2017). These studies show that increased activity within therapy sessions is possible.

2.1.4.1.2 Circuit classes and group therapy

Another option to increase physiotherapy treatment time could be to provide services in another format, such as a circuit classes or group therapy, rather than one-on-one therapy. Key components of this approach to increase therapy time consist of therapy delivered in a group setting, using higher patient-to-staff ratio (more than 1:1 ratio), and a focus on repetitive functional task training with ongoing individualisation and progression of exercises (English & Hillier, 2010; English & Hillier, 2011). Circuit classes have been used to increase the amount of time stroke survivors spend participating in therapy (English, Hillier, Kaur, & Hundertmark, 2014; English & Hillier, 2010), with participants receiving an extra 35-90 minutes of therapy per day compared to individual therapy (English, Hillier, et al., 2014; English, Hillier, Stiller, & Warden-Flood, 2007), as well as increasing the number of stroke survivors seen at one time (English & Hillier, 2010). In the stroke population undergoing rehabilitation, circuit classes have been shown to improve walking speed, balance confidence and reduce LOS (English & Hillier, 2010) as well as improve mobility and upper limb function when circuit classes are provided in addition to individual physiotherapy treatment sessions (English et al., 2007). Benefits of group therapy have also been seen in general rehabilitation populations, leading to increased standing balance and mobility performance, with a trend towards reduced LOS (Treacy, Schurr, Lloyd, & Sherrington, 2015). In the outpatient setting, circuit classes have demonstrated improved gait speed (van de Port, Wevers, Lindeman, & Kwakkel, 2012), distance walked (van de Port et al.,

2012) and endurance (Mudge, Barber, & Stott, 2009) in stroke populations, and improved mobility in patients with mobility impairments (Sherrington et al., 2008). In post- hip fracture populations, group therapy has shown reduced fracture rates (Cheung et al., 2018), improved balance (Cheung et al., 2018; Hauer, Specht, Schuler, Bartsch, & Oster, 2002), strength (Hauer et al., 2002) and functional motor performance (Hauer et al., 2002), reduced falls-related behaviour (Hauer et al., 2002) and lower health care costs (Cheung et al., 2018).

However, there are limitations to the implementation of circuit classes or group therapy. Firstly, in terms of generalisability, the majority of studies investigating circuit classes in rehabilitation have been limited to the stroke population (English et al., 2007; English & Hillier, 2010; English & Hillier, 2011; Mudge et al., 2009; van de Port et al., 2012). This reduces the practical application of providing circuit-based therapy within the rehabilitation setting as many rehabilitation facilities treat a mixed case load. While circuit-based therapy appears to work well in the stroke population, it may not work as well with a combination of diagnoses, or with a case-mix which consists of populations less able to complete their own practice (due to physical or cognitive impairments), yet still require adequate treatment time. Therefore, investigation of this approach in mixed populations is needed prior to implementation as part of routine clinical practice.

2.1.4.1.3 Providing additional therapy

Increasing the time spent in physiotherapy, either by increasing the length of sessions, or increasing the number of sessions per day, has also been suggested as a strategy to increase physiotherapy service provision. People following a stroke have reported feeling that a large proportion of their time not in therapy was wasted, especially on weekends, and that they were waiting for something to happen (Eng, Brauer, Kuys, Lord, & Hayward, 2014). This perception is supported by a systematic review investigating activity levels of people with stroke, reporting that between 24-98% of the day was spent inactive or participating in non-therapeutic activity in both the acute and rehabilitation setting (West & Bernhardt, 2012). It has also been found that people with lower limb orthopaedic diagnoses in rehabilitation only spend approximately 4% of their day in therapy (physiotherapy and occupational therapy) (Peiris et al., 2012a) and that people with stroke spend approximately one hour in each of physiotherapy and occupational therapy per day (Foley et al., 2012). Patients following hip fracture receiving extra physiotherapy during their rehabilitation made greater improvements in ambulatory ability (Chudyk, Jutai, Petrella, & Speechley, 2009), were more likely to achieve independence in mobility, and had a reduced fear of falling (Kronborg, Bandholm, Palm, Kehlet, & Kristensen, 2016). It is therefore conceivable that engaging patients in more therapy time during the day is feasible and may result in improved patient outcomes, which could have additional benefits for the hospital as well.

Engaging patients in increased therapy time has been found to be beneficial to patients. In people following total knee replacement, greater time spent in rehabilitation is associated with an increase in physical function and QOL (Pua et al., 2016). Greater time spent in

physiotherapy after fractured hip resulted in reduced LOS and dependence (Kimmel et al., 2016). Increased therapy time has also been shown to improve function and reduce LOS and discharge care needs in the frail elderly (Hartley et al., 2016). In post-cardiac surgery populations, people receiving high-frequency physiotherapy (twice daily including weekends) have been shown to achieve functional milestones at a faster rate and have higher levels of satisfaction (van der Peijl et al., 2004) compared to people receiving low-frequency physiotherapy (once daily on weekdays). However, increasing dose practice into a mixed rehabilitation setting may be limited due to a number of factors such as the ability of staff to safely supervise patients with a mix of diagnoses or with reduced levels of function, and reduced cognitive ability of patients to accurately monitor number of exercise repetitions.

One example of engaging patients in more therapy time could be constraint-induced movement therapy. This intervention is designed to improve arm function after stroke and involves constraining the less-affected upper limb and providing intense, functionally directed task practice to the affected upper limb for 90% of waking hours over a two week period (Nijland, Kwakkel, Bakers, & van Wegen, 2011; Peurala et al., 2012). This approach to increasing therapy time and activity has been shown to improve hand use, mobility of the affected upper limb and participation in self-care in people with stroke compared to patients receiving traditional rehabilitation (Peurala et al., 2012). A similar strategy has also been implemented for postural control. An intensive massed practice approach involving six hours a day of one-on-one therapy over two weeks with people with stroke resulted in improved time to regain balance, balance control (anticipatory and steady-state), weight

bearing symmetry and reduced falls (Vearrier, Langan, Shumway-Cook, & Woollacott, 2005). While it has been demonstrated that massed practice and constraint-induced movement therapy may be valuable, the application within routine practice in current rehabilitation service models in Australia may be limited due to several reasons. Providing this amount of one-on-one therapy time for inpatient rehabilitation can be difficult due to limited staffing numbers to ensure adherence to the protocol and safety of the intervention. There may be a lack of suitable patients for massed practice as the study investigating massed practice included only those patients with mild-moderate balance impairments, intact cognition and higher-level functioning in the affected leg (Vearrier et al., 2005). These intensive time approaches may also be limited by competing demands on patient therapy time, as they may need to also devote time to other therapies such as speech pathology.

2.1.4.1.4 Encouraging independent practice

Increasing the amount of independent practice a patient completes is another method that could be used to increase efficiency and intensity of practice, and is routinely completed in rehabilitation units in Australia. Recent Australian clinical guidelines for stroke management recommend that stroke survivors be encouraged to continue active task practice outside of therapy sessions, utilising independent, self-directed practice or supervised/assisted practice with family or friends (Stroke Foundation, 2017). This method involves developing detailed exercise programs for patients to complete independently on the ward or at the bedside, without a therapist present. However, patients must be able to independently practice, be motivated to practice and be cognitively able to complete the exercise program safely. The assistance of family members or friends may be required, depending on the

patients function and safety. A family-mediated exercise program has been investigated in the acute stroke population, resulting in improved function and reduced levels of reported carer burden (Galvin, Cusack, O'Grady, Murphy, & Stokes, 2011). In addition to this, nursing staff could incorporate practice of functional tasks in their daily cares, such as the supervision of walking to the toilet or dining room.

A systematic review has investigated home-based exercise programs in a range of diagnostic groups (Novak, 2011). Home programs were found to have more favourable results when participants were involved in the development of the exercise program, provided exercises that spanned across the International Classification of Function framework – including exercises targeting the activities and environmental levels, and when participants were provided feedback about their progress (Novak, 2011). While exercising at home compared to the inpatient rehabilitation setting likely means that participants in this review have more chronic impairments, the learnings from this review focusing on development and feedback of exercise programs are likely to translate into the rehabilitation setting.

Factors associated with a person's ability to participate in independent practice has been investigated in inpatient stroke populations (Eng et al., 2014). Factors that positively impact a patient's drive to participate in independent practice include ensuring the practice tasks are a continuation of what has been occurring in therapy, and setting exercises that enable patients to practice these skills in real world tasks. Emotional factors must also be considered, including dealing with the grief and loss of function post-stroke, support of family and friends, positive staff and doctor attitudes towards their progress to build motivation, and observing the progress of other stroke survivors to build hope (Eng et al.,

2014). Patients with stroke also commented on the lack of opportunity to participate in independent practice outside of therapy time, which they perceived should be organised by clinical staff (Eng et al., 2014). They expressed a desire for more organised activities during the day, and especially on weekends, to enable them to practice skills learnt in therapy, such as craft or cooking groups, but appeared to rarely take it upon themselves to create opportunities to participate in independent practice. Despite this, a study investigating the utilisation of nursing staff to provide extra opportunities for people with stroke in rehabilitation to practice on a weekend, resulting in an average of 13 minutes of extra intervention per weekend day, found no improvement in function or LOS (Davidson, Hillier, Waters, Walton, & Booth, 2005). As this amount of time is less than the extra 19 minutes of therapy time previously found to result in to improved function and reduced LOS (Peiris et al., 2011), it is likely that patients are required to spend more than the 13 minutes found in this study participating in therapy practice outside scheduled therapy times.

One strategy to increase independent practice may be providing equipment in patient's rooms or in ward common areas (Eng et al., 2014). This is the basis of developing enriched environments in rehabilitation wards. Enriched rehabilitation environments have been shown to increase activity and reduce time spent inactive and alone in stroke populations (Janssen et al., 2014) with participants reporting increased social interaction, and stimulation (motor, cognitive and sensory) as well as reduced boredom and feeling more in control of their recovery (White, Bartley, Janssen, Jordan, & Spratt, 2015).

Some limitations have been reported with utilising the enriched environments. Stroke survivors with mobility and functional restrictions reported feeling frustrated and had

difficulty accessing the enriched environment areas (White et al., 2015). These patients had a greater dependence on staff to assist them with mobility to the communal areas and reported that they did not want to be a burden on the staff. While some reported that the staff were generally accommodating of their desire to access and participate in the enriched environment, this population were more likely to report feeling bored as they spent large periods of time at the bedside. Pre-existing conditions such as vision impairment, were another limiting factor enabling stroke survivors to participate in some enriched environment activities such as reading and computer access (White et al., 2015).

While independent practice and enriched environments have been shown to increase function in stroke populations in rehabilitation, particularly in upper limb function (Harris, Eng, Miller, & Dawson, 2009) and walking distance (Galvin et al., 2011), there has been no research on the impact on LOS. It has already been established that increased therapy time reduces LOS and improves function (Peiris et al., 2011), so it is reasonable to propose that adding independent practice and participating in enriched environments outside of therapy time would assist in achieving these benefits. Apart from the initial outlay of costs involved in setting up the enriched environments, there would be minimal staff impacts of implementing this into routine practice, although this has not been formally investigated. These impacts would be in developing independent exercise programs for patients, reminding patients to utilise the enriched environments and in enabling access for patients with mobility restrictions. Therefore, this could be one method to increase efficiency and patient intensity of practice with minimal impact on staff, however, it has not yet been determined if independent practice and enriched environments result in reduced LOS.

2.1.4.1.5 Utilising therapy assistants

Increasing efficiency in rehabilitation could also be achieved by increasing the use of therapy assistants. Therapy assistants have been a key part of the health workforce, and enable therapy tasks and duties that require less developed skills to be delegated away from the therapist (APA, 2008; OTA, 2015). A therapy assistant is a health care worker who performs duties under the guidance and supervision of a registered treating therapist (APA, 2008). This supervision can be direct, indirect or remote (OTA, 2015). There may be formal education or training required for a person to be employed as a therapy assistant, depending on the facility (State Government of Victoria, 2012). Therapy assistants may be employed to work for one specific therapy discipline (e.g. physiotherapy assistant) or as a general therapy assistant (allied health assistant). Therapy assistants play an important role in increasing the availability of allied health services, at a time when the health requirements, especially that of the ageing population, are growing, and the demand may be unable to be met by therapists alone (Robinson, Tuner DePalma, & McCall, 1995).

There are a range of factors a therapist needs to consider before delegating tasks to a therapy assistant (APA, 2008). This involves determining if the therapy assistant has the appropriate level of training, competence and experience to carry out the task. Ultimately, the treating therapist is accountable for the task that is delegated to the therapy assistant (APA, 2008; OTA, 2015). Therapy assistants can complete therapy tasks in an individual or group setting. By utilising therapy assistants, therapists could treat a greater number of patients at once or provide an increased number of sessions of therapy to patients.

However, there is limited research on the impact of therapy assistants on patient outcomes, assistant utilisation or intensity of practice in rehabilitation, to determine if this method increases efficiencies in rehabilitation. One study into occupational therapy assistants leading group therapy programmes in aged care rehabilitation found there was no difference in the outcomes of patients with therapy assistants running the groups compared to occupational therapists (Cox, Mills, Fleming, & Nalder, 2014). This could demonstrate potential cost savings to the health system, or increased staffing options as an adjunct to therapist staffing. In Australia, depending on the size of a rehabilitation unit, the ratio of one therapy assistant per rehabilitation unit is common, and therefore the therapy assistants' role is often in managing equipment or organising groups, rather than supervising practice. The utilisation of therapy assistant staff requires further investigation to evaluate their impact on function or LOS and improve efficiency of practice.

2.1.4.2 Increasing physiotherapy services

One method of increasing the amount of physiotherapy provided is to increase the amount of time physiotherapy is available. This can be done via two methods: on-call or extended hours of care during weekdays, or weekend service provision.

2.1.4.2.1 On-call or extended hours

On-call or extended hours of physiotherapy enables more patients to be seen or patients to be seen multiple times during the day (Ntoumenopoulos & Greenwood, 1996), as well as managing cardiorespiratory and orthopaedic patients requiring physiotherapy beyond usual

working hours (Gough & Doherty, 2007). This service model is usually implemented in the acute setting, which allows physiotherapists more continuous management of acute respiratory conditions and complications occurring outside normal business hours (Devroey, Buyse, Norrenberg, Ros, & Vincent, 2016). This is especially relevant as the hospital system is structured to provide care 24 hours a day, not just during business hours. European Society of Intensive Care Medicine guidelines report that a physiotherapist should be available in intensive care units 24 hours a day, seven days a week (Valentin, Ferdinande, & ESICM Working Group on Quality Improvement, 2011). There is medium to strong evidence that on-call physiotherapy services improve short-term outcomes (oxygenation) in intensive and critical care units providing on-call services (Brusco & Paratz, 2006) and preliminary evidence for the improvement of longer term patient outcomes, such as reductions in intensive care unit LOS and time on a ventilator (Berney, Stockton, Berlowitz, & Denehy, 2002; Brusco & Paratz, 2006; Ntoumenopoulos & Greenwood, 1996). Improvements in function, respiratory outcomes and perceived improvements in wellbeing have also been shown with on-call physiotherapy provision for acute exacerbations of people with chronic obstructive pulmonary disease (Babu, Noone, Haneef, & Samuel, 2010).

On-call and extended hours of physiotherapy have been utilised to complete early mobilisation protocols in orthopaedic populations. Mobilising patients with total joint replacement several hours after surgery has been shown to reduce LOS by up to five days (Morris, Benetti, Marro, & Rosenthal, 2010; Winther et al., 2015). However, beyond the day of surgery, it is not a routine occurrence for patients to be seen after hours unless acutely unwell. While the impact of evening physiotherapy services beyond patient outcomes have

not been explored, it is likely that this would impact on patient rest/sleeping time, family engagement in the evenings, and physiotherapy service costs. On-call and extended hours of physiotherapy services have only been investigated in the acute sector, therefore the benefits of providing such a service in the rehabilitation sector have not yet been illustrated.

2.1.4.2.2 Weekend service provision

Delivering a weekend service is another method to increase the amount of physiotherapy provided. A weekend service enables patients to be seen 6- or 7-days per week, compared to only 5-days. Weekend services are more commonly implemented in the acute setting, but less prevalent in the rehabilitation setting in Australia (Shaw et al., 2013). Acute weekend services have been shown to result in reduced LOS in orthopaedic (Hughes et al., 1993; Pua et al., 2011; Rapoport & Judd-VanEerd, 1989) and non-surgical neurological populations (Rapoport & Judd-VanEerd, 1989) with no adverse events on complication rates. Also reported are improvements in patient functional outcomes in orthopaedic populations (Lang, 1998), faster achievement of functional outcomes in populations post cardiac surgery (van der Peijl et al., 2004), and reduced patient deterioration in the acute setting (McAuley, 1999). Weekend services also facilitate physiotherapy review of patients prior to discharge, enabling these patients to be discharged over the weekend rather than remaining in hospital until Monday (Heck et al., 2001), and may facilitate the progression of patients admitted later in the week or on the weekend (Pua et al., 2011). Patients in the acute cardiac surgery population have also reported a preference for weekend physiotherapy services compared to weekday-only care (van der Peijl et al., 2004). These

positive results have led to the development of weekend physiotherapy services in the acute setting becoming part of usual service delivery.

2.1.5 Acute weekend physiotherapy service provision

Acute weekend service provision has been explored by several studies; though interestingly only in Canada and Australia. Published journal articles on weekend service provision in other countries could not be found. There do appear to be some weekend allied health programs that have been trialled in acute hospitals in the United Kingdom (NHS Improvement, 2012), which have reported earlier assessments, improved continuity of care, reduced LOS and improved patient throughput in various populations and acute settings. However, these services have not been peer-reviewed.

Weekend therapy provision in Canada appears to have been explored in detail. One study reported that 97% of tertiary-care hospitals (defined as university-affiliated hospitals with an intensive care unit, average 423 SD 250 beds) provided a weekend physiotherapy service (Campbell et al., 2010). The weekend service was provided on both weekend days and public holidays in 90% of facilities surveyed (Campbell et al., 2010). Additionally, approximately 70% of Canadian acute care community hospitals (defined as having more than 100 beds, offering acute care services but not considered a tertiary-care centre) provided a weekend physiotherapy service (Ottensmeyer et al., 2012). Of these, 99% offered a Saturday service, and approximately 80% offered a Sunday or public holiday service (Ottensmeyer et al., 2012). Thus, in Canada, weekend physiotherapy services

appear to be routine practice in tertiary hospitals but are not offered as extensively in smaller community hospitals.

There has only been one study that has investigated weekend service provision adoption in Australia. A 2011 survey of Australian hospitals found that 61% of hospitals provided a Saturday service and 45% provided a Sunday service (Shaw et al., 2013). This is lower than that seen in the Canadian studies (Campbell et al., 2010; Ottensmeyer et al., 2012); however, the Canadian studies surveyed only tertiary and community care hospitals, all of which were acute hospitals, whereas the Australian survey investigated all hospitals throughout Australia, including both the acute and rehabilitation sectors.

2.1.5.1 Characteristics of acute weekend service provision

Weekend physiotherapy services appear to provide less staffing and fewer hours of service than that provided during the week, (Campbell et al., 2010; Shaw et al., 2013). Physiotherapy staffing on weekends is reduced by approximately 88% compared to that provided on weekdays (Campbell et al., 2010; Hill & Brooks, 2010). In large tertiary Canadian facilities approximately three physiotherapists were found to work on each weekend day and public holiday (Campbell et al., 2010). In smaller or community facilities most weekend services were staffed by a single physiotherapist (Hill & Brooks, 2010; Ottensmeyer et al., 2012). Regardless of staffing numbers, working hours were similar, on average 6.2 (Ottensmeyer et al., 2012) to 6.5 hours per staff member per day (Campbell et al., 2010) with more than 75% of working hours dedicated to patient care (Hill & Brooks, 2010). However, differences were found between hospitals with respect to number of

patients treated per hour (Hill & Brooks, 2010), which may be due to different populations or criteria used between facilities, as well as the number of beds required to be covered by each physiotherapist.

Weekend service provision appears to differ by hospital size and location. Australian trends follow that of Canadian hospitals, with 93% of large hospitals (more than 100 beds) providing weekend physiotherapy services compared to 43% of medium (30-100 beds) and small (less than 30 beds) hospitals (Shaw et al., 2013). More metropolitan hospitals (90%) provided extended hours of physiotherapy service compared to rural/regional hospitals (28%), with the majority of rural hospitals not providing any extended hours of physiotherapy service (Shaw et al., 2013).

Physiotherapy weekend service provision also appears to differ by patient acuity. The majority of highly acute wards (e.g. intensive and coronary care units, emergency and short stay departments) provided physiotherapy on both weekend days and provided more hours of weekend physiotherapy compared to acute (e.g. surgical, medical and maternity wards) and sub-acute wards (e.g. rehabilitation and transition care wards) outside of business hours (Shaw et al., 2013).

Australian weekend service provision also varied by funding source. More privately funded hospitals provided weekend services on both a Saturday (91%) and a Sunday (61%), while only 46% and 35% of public facilities provided weekend services on a Saturday and a Sunday

respectively (Shaw et al., 2013). Private hospitals also provided a significantly greater number of hours on a Saturday, with a trend for increased hours on a Sunday, compared to publicly funded hospitals (a median of 3.7 hours/day per 30 beds on a Saturday and 0.5 hours/day per 30 beds on a Sunday in private hospitals compared to zero in public hospitals) (Shaw et al., 2013). A breakdown of respondents was not provided so it is unclear as to whether hospital size or staffing was different between the public and private hospital respondents.

Reasons for providing a weekend service in Australia were also explored by Shaw and colleagues (2013). The main determinants of weekend service provision were reported to be funding entitlement (impact of private health insurance) and past models of service provision, as opposed to research recommendations and staff availability. A survey of clinical department managers or administrators of freestanding rehabilitation facilities or rehabilitation units of general hospitals in the USA in the 1980s reported that staff perceived weekend therapy was implemented to increase hospital utilisation, reduce LOS and prevent patient boredom (Hooper & Dijkers, 1987). It has also been suggested that the greater number of private hospitals providing outside business hours physiotherapy services in Australia may be due to the increased ability for private hospitals to invest money and resources in these services if they are perceived to improve patient and hospital outcomes, meet patient expectations and increase profit (Shaw et al., 2013).

2.1.6 Rehabilitation weekend therapy service provision

Weekend physiotherapy services provided in rehabilitation wards appear to be less than those provided in acute wards. Approximately 30% of rehabilitation wards in Australia surveyed provided weekend physiotherapy, with only 12% providing physiotherapy services on both weekend days (Shaw et al., 2013). While an acute comparison has not been reported in the USA, 82% of rehabilitation units provide a weekend service (Hooper & Dijkers, 1987). This study occurred 30 years ago, however the USA Department of Health and Human Services currently recommends that inpatient rehabilitation therapy services must be provided at least 5-days per week (Centers for Medicare & Medicaid Services, 2012) suggesting an ongoing commitment to weekend rehabilitation services. Australian rehabilitation wards also received less physiotherapy staffing on weekends compared to acute wards (Shaw et al., 2013). There is limited information available on weekend service provision in rehabilitation and the relationship with hospital size, funding source, diagnostic population, staffing levels, optimal service models, criteria used to determine who receives weekend rehabilitation, or how services are being evaluated. Given the positive benefits found in the acute setting, it seems likely that these benefits may be seen in the rehabilitation setting as well.

2.1.6.1 The efficacy of weekend service provision in rehabilitation

Several studies have investigated the impact of a weekend service in the rehabilitation setting on LOS and patient outcomes (Brusco et al., 2007; DiSotto-Monastero et al., 2012; English et al., 2015; English et al., 2016; Hakkennes, Lindner, & Reid, 2015; Peiris, Shields, et al., 2013; Ruff et al., 1999), service utility (DiSotto-Monastero et al., 2012; English et al.,

2015; English et al., 2016; Hakkennes et al., 2015; Peiris, Shields, et al., 2013) and cost effectiveness (Brusco et al., 2014, 2015). These studies will be discussed below and have been summarised in Table 2-1. These studies varied in terms of number of days of weekend therapy, disciplines of care, study design and quality, and outcomes found with weekend service provision in rehabilitation.

Of the studies investigating weekend therapy provision in rehabilitation, three Australian studies utilised RCT methodology to investigate the efficacy of this intervention: Brusco et al. (2007), English et al. (2015), and Peiris, Shields, et al., (2013). One of these RCTs (Peiris, Shields, et al., 2013) had two related economic analyses completed from the same dataset (Brusco et al., 2014, 2015). One study was a meta-analysis (English et al., 2016) completed using data from the RCTs of English et al. (2015) and Peiris, Shields, et al. (2013). The remaining studies consisted of a cross-sectional data review (DiSotto-Monastero et al., 2012), a quasi-experimental study with historical comparator (Hakkennes et al., 2015), and a quasi-RCT (Ruff et al., 1999). Five studies investigated 5-day vs 6-day therapy provision (Brusco et al., 2007; Brusco et al., 2014, 2015; Hakkennes et al., 2015; Peiris, Shields, et al., 2013), two studies compared 5-day with 7-day (DiSotto-Monastero et al., 2012; English et al., 2015), while the final two studies compared 6-day with 7-day weekend therapy (English et al., 2016; Ruff et al., 1999). Two of the studies investigated the impact of physiotherapy weekend service provision (Brusco et al., 2007; English et al., 2015), while the remainder of the studies used a multidisciplinary weekend approach (Brusco et al., 2014, 2015; DiSotto-Monastero et al., 2012; English et al., 2016; Hakkennes et al., 2015; Peiris, Shields, et al., 2013; Ruff et al., 1999).

Table 2-1: Summary of studies investigating weekend service delivery.

Authors	Intervention	Participant characteristics, inclusion/exclusion	Results
Brusco et al. (2007) RCT	Control: 5-day vs Exper: 6-day = an additional 1 hour PT	• Mixed diagnosis • Inclusion criteria: Aged ≥ 18 years • Exclusion criteria: MMSE < 24/30 • Control grp: n=132, avg. 77 years, 40% male • Exper grp: n=130, avg. 77 years, 45% male	• More PT interventions in exper grp (24.3 vs 20.2, 95%CI 0.2 to 8) • NSD in hospital (21.2 vs 24.4 days, 95%CI -0.5 to 6.9) or PT LOS (19.6 vs 22.1 days, 95%CI -0.9 to 5.9), EuroQol, FIM, FR, 10MWT, TUG, MAS, flexibility, DC destination, adverse events or requiring follow up; greater strength exper grp
Brusco et al. (2014) Economic evaluation with Peiris et al. 2013	Control: 5-day vs Exper: 6-day = an additional 1 hour PT + OT	• Mixed diagnosis • Inclusion criteria: Aged ≥ 18 years, orthopaedic, neurological or other disabling condition • Exclusion criteria: slow stream rehabilitation, enrolled in another trial • Control grp: n=500, avg. 75 years, 38% male • Exper grp: n=496, avg. 74 years, 34% male	• Trend reduced rehabilitation cost exper grp ($15,859 vs $17,532, 95%CI -3,618 to 271) • Higher change in health related QOL (mean diff 0.04, 95%CI 0.01 to 0.07) and higher rate of change/day (mean diff 0.004, 95%CI 0.001 to 0.008) in exper grp • Saved $41,825 (95%CI −2,817 to 74,620) in ICUR/QALY gained and $16,003 in ICER (95%CI −3,074 to 87,361) achieving MCID in functional independence for exper grp • Probability of exper grp being cost effective = 95-96%
Brusco et al. (2015)[1] Economic sustainability follow-up 12 mths Peiris et al. 2013	Control: 5-day vs Exper: 6-day = an additional 1 hour PT + OT	• Mixed diagnosis • Inclusion criteria: Aged ≥ 18 years, orthopaedic, neurological or other disabling condition • Exclusion criteria: slow stream rehabilitation, enrolled in another trial • Control grp: n=500, avg. 75 years, 38% male • Exper grp: n=496, avg. 74 years, 34% male	• Trend reduced rehabilitation cost ($61,859 vs $68,184, 95%CI −16,730 to 4,081) • Reduced hospital LOS in following 12 mth (10.3 vs 15.2 days, 95%CI −9.0 to −0.9) • NSD in health related QOL index, ICER • Probability of exper grp being cost effective = 97% based on QALY or MCID gained in functional independence
DiSotto-Monastero et al. (2012) Cross-sectional data review	Control: 5-day vs Exper: 7-day PT + OT	• Mixed diagnosis • Inclusion criteria: receiving 5- and 7-day therapy • Exclusion criteria: participants other than this • Control grp: n=1692, avg. 72 years, 34% male • Exper grp: n=1808, avg. 72 years, 35% male	• More total and weekend admissions (6.9%, p = 0.006; 86%, p < 0.001); and total and weekend discharges (8.3% p = 1.85; 111.9%, p< 0.001) in exper grp • Increased therapy time/patient in exper grp (40.7 vs 36 hours, p < 0.001) • NSD LOS (19.3 vs 20.3 days, p = 0.43) or FIM scores
English et al. (2015) RCT	Control: 5-day vs Exper: 7-day PT	• Stroke population • Inclusion criteria: mod severity (FIM 40-80/FIM motor 38-62) • Exclusion criteria: nil • Control grp: n=94, avg. 68 years, 55% male • Exper grp: n=96, avg. 72 years, 61% male	• Greater avg. therapy time in exper grp over four weeks (18.2 vs 15.1hours, p=0.044) • NSD in LOS (mean diff 2.9 days, 95% CI -17.9 to 12.0), 6MWT, FAC, FIM, WMFT, SIS–physical and AQOL

Authors	Intervention	Participant characteristics, inclusion/exclusion	Results
English et al. (2016) Meta-analysis of individual patient data	Control: 6-day (Peiris et al (2013)) PT + OT vs Exper: 7-day (English et al (2015)) PT + OT	• Stroke population • Inclusion criteria: mod severity (FIM 40-80/ FIM motor 38-62), independent mobility prior • Exclusion criteria: nil • Control grp: n=81 (6-day) + n=79 (usual care), avg. 75 years, 54% male • Exper grp: n=96 (7-day) + n=94 (usual care), avg. 70 years, 58% male	• Increased weekday (267 vs 134mins/week, 95%CI 113 to 154) and weekend therapy in control grp (76 vs 36mins/week, 95%CI 33 to 50) • NSD for LOS with pooled weekend data (mean diff -5.7days, 95%CI -13.0 to 1.5) • Reduced LOS with control grp (34.1 vs 58.6days, p-value/95% CI not provided) • Receiving weekend therapy is an independent predictor of reduced LOS (mean diff 7.5days, 95%CI 1.7 to 13.4) • NSD in FIM scores, walking speed or health-related QOL
Hakkennes et al. (2015) Quasi-exper study with historical comparison	Control: 5-day vs Exper: 6-day MD, PT, OT, PTA, SW	• Mixed diagnosis • Inclusion criteria: prioritised: new admissions, DC facilitation, likely to deteriorate • Exclusion criteria: palliative/passed away, acute DC • Control grp: n=499, avg. 79 years, 37% male • Exper grp: n=477, avg. 79 years, 37% male	• Significantly higher DC FIM score in exper grp (112 vs 110) • NSD in LOS (19 vs 20 days) • Significantly more participants admitted on a Saturday in experimental group (48 vs 14 participants, p = 0.003)
Peiris et al. (2013) RCT	Control: 5-day vs Exper: 6-day = an additional 1 hour PT + OT	• Mixed diagnosis • Inclusion criteria: Aged ≥ 18 years, orthopaedic, neurological or other disabling condition • Exclusion criteria: slow stream rehabilitation, enrolled in another trial • Control grp: n=500, avg. 75 years, 38% male • Exper grp: n=496, avg. 74 years, 34% male	• Exper grp received 53 mins more therapy per week (95%CI 31 to 74) • Greater DC FIM scores exper grp (mean diff 2.3, 95%CI 0.5 to 4.1) and 6 mth (mean diff 2.0, 95%CI 0.0 to 4.0) but not 12 mth (mean diff 1.3, 95%CI -0.9 to 3.5) • Higher DC EQ-5D score exper grp (mean diff 0.04, 95%CI 0.01 to 0.07) but not 6/12 mth (mean diff 0.03, 95%CI -0.01 to 0.08; mean diff 0.01, 95%CI -0.04 to 0.05) • NSD in LOS (21 vs 23 days, 95%CI 0 to 4), PC-PART, modified MAS, TUG, 10mWT, discharge destination or adverse events
Ruff et al (1999) Quasi-random	Control: 6-day vs Exper: 7-day PT, OT, SP	• Stroke population • Inclusion criteria: stroke diagnosis • Exclusion criteria: nil • Control grp: n=57, age and gender not stated • Exper grp: n=56, age and gender not stated	• 82% participants preferred 6-day therapy • NSD in LOS (20.1 vs 20.1 days, p=0.98) • NSD in FIM scores

6MWT: 6 Minute Walk Test, 10MWT: 10 Meter Walk Test, AQOL: Australian Quality of Life Scale, avg.: average, control grp: control group, DC: discharge, EQ-5D: EuroQol 5-D, exper: experimental, exper grp: experimental group, FAC: Functional Ambulation Classification, FIM: Functional Independence Measure, FR: Functional Reach, ICER: incremental cost effectiveness ratio, ICUR: incremental cost utility ratio, LOS: length of stay, MAS: Motor Assessment Scale, MCID: minimal clinically important difference, MD: medical doctor, mean diff: mean difference, MMSE: Mini Mental State Exam, mod: moderate, mth: months, N/A: not available, n: number of, NSD: no significant difference, OT: occupational therapy, QALY: quality-adjusted life year, QOL: quality of life, PC-PART: Personal Care Participation Assessment and Resource Tool, PT: physiotherapy, PTA: physiotherapy assistant, RCT: randomised controlled trial, SIS-physical: Stroke Impact Scale physical subscale, SP: speech pathology, SW: social work, TUG: Timed Up and Go Test, vs: versus, WMFT: Wolf Motor Function Test. [1]Brusco et al. (2014) and (2015) report different outcome measures from the same cohort

Studies investigating weekend service delivery have utilised RCT (Brusco et al., 2007; Brusco et al., 2014, 2015; English et al., 2015; Peiris, Shields, et al., 2013), experimental (DiSotto-Monastero et al., 2012; Hakkennes et al., 2015; Ruff et al., 1999) and meta-analysis methodology (English et al., 2016). The studies investigating weekend rehabilitation have been rated for quality according to the Physiotherapy Evidence Database (PEDro) criteria in Table 2-2. The 11-item PEDro quality rating scale considers two aspects of trial quality; internal validity, and whether the trial contains sufficient statistical information to make it interpretable (PEDro, 2018). The former includes criteria relating to random allocation, and concealment of allocation, comparison of groups at baseline, blinding of participants, therapists and assessors, intention to treat analysis and adequacy of follow up. To determine interpretability, between-group statistical comparison and presentation of point estimates and measures of variability are required. Studies are scored out of 10, with a point awarded only if there was clear evidence that criteria were met.

Overall, the quality of the studies investigating weekend rehabilitation services was good, with most studies scoring between five and eight out of 10. In all studies, subjects or therapists administering the therapy were unable to be blinded, due to the nature of the intervention, thus the maximum score possible was 8/10. Five studies (Brusco et al., 2007; Brusco et al., 2014; English et al., 2015, 2016; Peiris et al,. 2013) blinded assessors, which reduced the potential for bias on measuring outcomes. Three studies (DiSotto-Monastero et al., 2012; Hakkennes et al., 2015; Ruff et al., 1999) did not randomly allocate to groups, which could introduce bias into the studies if participants more suited to weekend therapy

Table 2-2: Studies investigating weekend service delivery in rehabilitation and rating on PEDro Scale.

Criteria	Brusco et al. (2007)	Brusco et al. (2014)	Brusco et al. (2015)	DiSotto-Monastero et al. (2012)	English et al. (2015)	Hakkennes et al. (2015)	Peiris et al. (2013)	Ruff et al (1999)
Eligibility criteria specified*	✓	✓	✓	✓	✓	✓	✓	✓
Subjects randomly allocated to groups	✓	✓	✓	✗	✓	✗	✓	✗
Allocation concealed	✓	✓	✓	✗	✓	✗	✓	✗
Groups similar at baseline (regarding most important prognostic indicators)	✓	✓	✓	✓	✓	✓	✓	✗
Blinding of all subjects	✗	✗	✗	✗	✗	✗	✗	✗
Blinding of all therapists who administered therapy	✗	✗	✗	✗	✗	✗	✗	✗
Blinding of all assessors who measured at least one key outcome	✓	✓	✓	✗	✓	✗	✓	✗
Measures of at least one key outcome were obtained from > 85% of subjects initially allocated to groups	✓	✗	✗	✓	✓	✓	✓	✗
All subjects for whom outcome measures were available received treatment or control condition as allocated (or where this was not the case, data for at least one key outcome was analysed by "intention to treat")	✓	✓	✓	✓	✗	✓	✓	✓
Results of between-group statistical comparisons reported for at least one key outcome	✓	✓	✓	✓	✓	✓	✓	✓
Study provides both point measures and measures of variability for at least one key outcome	✓	✓	✓	✓	✓	✓	✓	✗
Total score /10	**8**	**7**	**7**	**5**	**7**	**5**	**8**	**2**

*This item is not used to calculate the PEDro score

were allocated to weekend therapy than control groups and could lead to skewed results. Two studies (Brusco et al., 2014, 2015) were only able to obtain follow up outcomes from 82% of the original cohort, due to death of participants at the follow up timeframes (six and 12 months). However, as this loss to follow up occurred evenly across both intervention and control groups, it is unlikely to have impacted the study results. Ruff et al., (1999) similarly was only able to follow up 71% of the recruited participants, and the study did not report any measures of size of treatment effect. Given this study's low score on the PEDro scale, the results of this study should be interpreted with caution, especially given the more robust designs used in the other studies investigating weekend rehabilitation service.

The gold standard used in research for determining how specific treatments affect health is an RCT (Wells, 1999). RCTs are concerned with investigating the efficacy of an intervention – whether a specific intervention improves outcomes compared with a control group (Wells, 1999). RCTs are usually clinical trials that are highly controlled, testing treatments in ideal or best-practice conditions to a randomly allocated, narrowly defined homogenous group in order to reduce bias and confounding variables (Glasgow, Lichtenstein & Marcus, 2003; Wells, 1999). The RCTs investigating rehabilitation weekend services scored higher on the PEDro scale (Brusco et al., 2007; Brusco et al., 2014, 2015; English et al., 2015; Peiris, Shields, et al., 2013) compared to studies with other designs (Table 2-2). Therefore, it is reasonable to place more weight on the findings of these studies – LOS reductions of 2-3.2 days with 6-day physiotherapy (Brusco et al., 2007) or physiotherapy and occupational therapy serivce provision in mixed rehabilitation populations (Peiris, Shields, et al., 2013), and 2.9 days in stroke populations with 7-day physiotherapy (English et al., 2015); improved

functional independence and QOL (Brusco et al., 2007; Peiris, Shields, et al., 2013), likely cost effectiveness with 6-day therapy provision (Brusco et al., 2014, 2015). While this approach might provide evidence of the efficacy of weekend service provision with a low risk of bias, studies utilising RCT methodology have limitations in guiding clinical policy and practice about these treatments due to their implementation and design features (Wells, 1999), and may not be reflective of the patient populations, conditions and working environments of the real world. A clinical effectiveness study investigates these interventions under 'real world' conditions and can enable results to be applied to a wider population (Ford & Norrie, 2016) (Figure 2-3).

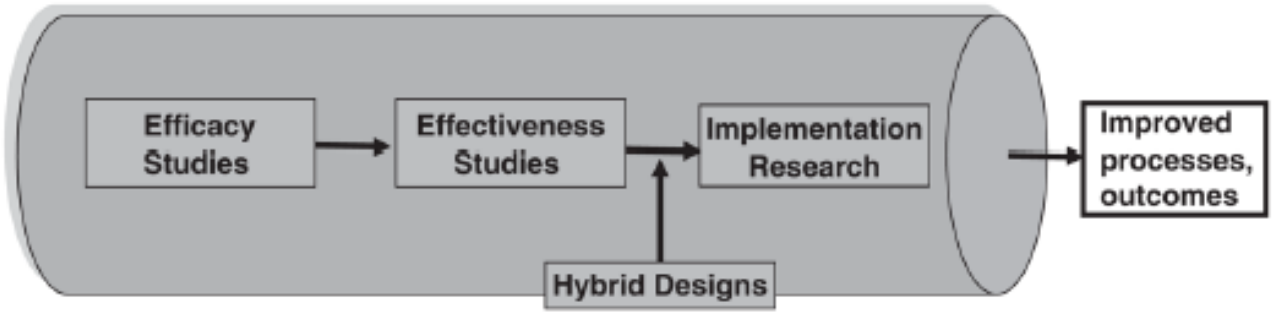

Figure 2-3: The relationship between efficacy, effectiveness, implementation and hybrid studies, resulting in improved patient outcomes (Curran, Bauer, Mittman, Pyne & Stetler, 2012).

Participant population must also be taken into account when critiquing these studies. Studies with larger populations enable greater applicability of the results. Of the studies investigating weekend rehabilitation services, three RCTs (Brusco et al., 2014, 2015; Peiris, Shields, et al., 2013) and two experimental studies (DiSotto-Monastero et al., 2012; Hakkennes et al., 2015) had populations of approximately 500 participants in each experimental cohort. Some studies limited the populations included in their studies based

on diagnosis (English et al., 2015, 2016; Ruff et al., 1999), cognitive impairment (Brusco et al., 2007) or functional impairment (English et al., 2015, 2016), while others included all patients in the rehabilitation units (DiSotto-Monastero et al., 2012; Hakkennes et al., 2015; Peiris, Shields, et al., 2013). Rehabilitation facilities tend to provide rehabilitation to mixed cohorts of varying functional and cognitive impairments (Kuys et al., 2016), therefore effectiveness studies allow clinicians to transfer findings from RCTs into 'real world' contexts. Effectiveness studies are more focused on external validity and generalisability, and therefore have more heterogenous population samples and study locations, while evaluating a range of clinical and other outcomes (Curran, Bauer, Mittman, Pyne & Stetler, 2012). Often, due to staffing limitations and departmental budgetary restraints, all patients in a rehabilitation unit are unable to be seen on weekends and are prioritised by clinicians, using eligibility criteria to identify and select the most appropriate patients (Campbell et al., 2010; McGlinchey & Davenport, 2015). As rehabilitation units often treat patients with a range of functional and cognitive impairments, it may be unrealistic to exclude patients from studies investigating weekend services simply due to these factors. Effectiveness studies can reflect these staffing limitations and patient selection criteria to explore how RCT findings can be reflected in generalised working environments. The effectiveness of providing a 6-day physiotherapy or multidisciplinary rehabilitation weekend service has not been investigated.

2.1.6.2 A comparison of usual weekday care with 6- or 7-day service

The first issue to consider when comparing these studies is number days of weekend therapy is provided. While no studies have found a statistically significant reduction in LOS,

two of the three studies investigating 6-day service provision appear to have found a greater reduction in LOS (2 to 3.2 days compared to usual 5-day service (Brusco et al., 2007; Peiris, Shields, et al., 2013)), than studies investigating 7-day services compared to usual care (up to one day) (DiSotto-Monastero et al., 2012; Ruff et al., 1999), regardless of whether usual care was 5- or 6-days. However, a recent investigation of 7-day therapy provision in stroke populations found LOS reduced by on average 2.9 days (English et al., 2015). This may be due to the study methodology used, with the studies investigating 6-day service utilising RCT methodology (Brusco et al., 2007; Peiris, Shields, et al., 2013), while only English and colleagues (2015) utilised RCT methodology in studies investigating 7-day service. Another reason for this difference in results of the 7-day studies may be due to the overall rehabilitation LOS. Participants in the latter study investigating 7-day service (English et al., 2015) had a longer LOS (control group mean LOS 55 SD 49 days; experimental group mean LOS 45 SD 38 days) than other studies investigating 7-day service (19-20 days) (DiSotto-Monastero et al., 2012; Ruff et al., 1999). It is possible therefore that participants with stroke may have received greater benefit from weekend services due to this longer LOS and ability to attend more weekend sessions, thus receiving a greater dose of therapy overall (English et al., 2015). Regardless of the number of days rehabilitation services were provided on the weekend, LOS differences did not reach statistical significance. Interestingly, patients seem to prefer 6-days of therapy rather than 7-days (Ruff et al., 1999). This could be due to patients perceiving a benefit from having a rest day from therapy.

The effect of weekend services on functional independence and QOL has also been investigated. Patients receiving a 6-day multidisciplinary therapy service showed improved functional independence scores and QOL when compared to a 5-day service (Peiris, Shields, et al., 2013), however this was not seen with an earlier 6-day physiotherapy service (Brusco et al., 2007). This may be due to the additional benefit of therapy input by occupational therapists, whose primary goal in the rehabilitation setting is to improve the functional independence and participation in everyday life occupations (OTA, 2018).

Several studies also investigated service utilisation and therapy time. Increased weekend admissions or discharges were found with weekend therapy provision, both for 6-day (Hakkennes et al., 2015) and 7-day service provision (DiSotto-Monastero et al., 2012). It is possible that in facilities that do not have a weekend service, weekend admissions would be avoided as assessment of admitting patients would not occur until Monday. With the provision of a weekend service, admission assessments could be completed on the weekend, leading to better flow in the rehabilitation unit. Most of the studies investigated therapy time or interventions, finding increased therapy time and interventions with weekend service provision, regardless of 6- or 7-days, or number of disciplines provided (Brusco et al., 2007; DiSotto-Monastero et al., 2012; English et al., 2015; English et al., 2016; Peiris, Shields, et al., 2013). The amount of extended weekend therapy hours ranged from approximately one extra hour of therapy per discipline per weekend (Brusco et al., 2007; English et al., 2015; Peiris, Shields, et al., 2013), to an extra 4.7 hours of therapy (DiSotto-Monastero et al., 2012) or an extra 4.1 therapy sessions (Brusco et al., 2007) provided to participants over their stay in rehabilitation. Two studies did not provide details regarding

how much extra therapy participants received on the weekend (Hakkennes et al., 2015; Ruff et al., 1999). Interestingly, the meta-analysis by English et al. (2016) found increased therapy time with 6-day service provision compared to 7-day service provision, with participants in the 6-day group receiving 267 minutes/week on weekdays and 76 minutes/week on weekends, compared to 134 minutes/week on weekdays and 36 minutes/week on weekends in the 7-day group. This could be due to variation in usual practice between rehabilitation units, as these services were provided at different locations.

2.1.6.3 Staffing expertise

The skills, expertise and currency of practice of staff could also influence service delivery. Patients in rehabilitation typically have complex conditions and/or multiple comorbidities requiring treatment and remain in hospital longer than acute hospital inpatients (Granger, Markello, Graham, Deutsch, & Ottenbacher, 2009; Granger et al., 2010a; Granger et al., 2011). Staff working over extended periods of time in rehabilitation may develop specialised skills to manage this diverse patient group and to enable patients to remain actively engaged in their rehabilitation program throughout their stay. Three studies investigating weekend therapy indicated that usual therapists developed the treatment plan that was to be provided on the weekends (Brusco et al., 2007; English et al., 2015; Peiris, Shields, et al., 2013), suggesting that rehabilitation expertise is integral to weekend rehabilitation service delivery. Therefore, using therapists with expertise, skills and currency of rehabilitation practice to deliver and progress rehabilitation interventions appropriately and with awareness of specific rehabilitation procedures may contribute to the efficiency and effectiveness of the service provided on a weekend.

Advanced staff training and development of specialised skills, experience and knowledge have been shown to be result in improved outcomes for stroke patients managed in acute stroke units (National Stroke Foundation, 2010). These improved outcomes include delivery of highly effective stroke care (National Stroke Foundation, 2010), reduced mortality and disability (Stroke Unit Trialists' Collaboration, 2013), improved function and reduced LOS (Foley, Salter, & Teasell, 2007). Similarly, people with hip fracture receiving specialised individual comprehensive geriatric care spend more time upright and have improved lower limb function compared to standard orthopaedic care (Taraldsen, Sletvold, Thingstad, Lydersen, & Helbostad, 2014). The most recent clinical guidelines for the management of Parkinson's disease in adults also recommends that people with Parkinson's disease be referred to allied health therapists experienced in Parkinson's disease for assessment and advice regarding physical activity, motor and non-motor symptoms, communication and swallowing difficulties (NICE, 2017). Given that the Australasian Faculty of Rehabilitation Medicine Standards for the Provision of Inpatient Adult Rehabilitation Medicine in Public and Private Hospitals stipulate that staff should have an appropriate level of skills to provide comprehensive, up to date programs of care (Australasian Faculty of Rehabilitation Medicine, 2011), it is reasonable to suggest that rehabilitation units employing staff who have skills and knowledge, as well as currency of rehabilitation practice on both weekdays and weekends may result in improved outcomes for patients. However, no research has been undertaken investigating the impact of staff expertise in rehabilitation.

2.1.6.4 Staffing disciplines

It is important to consider the impact of staffing disciplines providing weekend rehabilitation services. The Australasian Faculty of Rehabilitation Medicine Standards for the Provision of Inpatient Adult Rehabilitation Medicine in Public and Private Hospitals indicate that multidisciplinary allied health staffing should be provided on a minimum of five days per week (Australasian Faculty of Rehabilitation Medicine, 2011). If multidisciplinary therapy input from physiotherapy and occupational therapy (with speech pathology and dietetic involvement occurring as needed) (Australasian Faculty of Rehabilitation Medicine, 2011) is required to be provided during the week, it seems reasonable that this should also be provided on a weekend, if weekend rehabilitation services are provided.

Weekend physiotherapy and occupational therapy in rehabilitation appears the most common staffing models. Thirty years ago, a survey of weekend rehabilitation in the USA found that 67% of rehabilitation units provided physiotherapy and 51% provided occupational therapy on a weekend (Hooper & Dijkers, 1987). However, despite the common use of both physiotherapy and occupational therapy on weekends in rehabilitation units at least in the USA, the efficacy of this staffing model has only been investigated in one RCT investigating weekend service provision in rehabilitation (Peiris, Shields, et al., 2013). Other RCTs have investigated physiotherapy only weekend services (Brusco et al., 2007; English et al., 2015). Regardless, all have found similar reductions in LOS. Experimental studies investigating the effectiveness of weekend service provision in rehabilitation have been staffed with multidisciplinary weekend services (DiSotto-Monastero et al., 2012; Hakkennes et al., 2015; Peiris, Shields, et al., 2013; Ruff et al., 1999). Therefore, it is

important to compare the impact of physiotherapy alone in weekend therapy provision, as well as physiotherapy provision in combination with occupational therapy in weekend service provision.

2.1.6.5 Staff perceptions of weekend service provision in rehabilitation

Clinical staff are key stakeholders in the implementation of a new or modified service. The perceptions and involvement of clinical staff in the rehabilitation unit – medical, nursing and allied health – are important for the effectiveness and success of a new service being introduced in rehabilitation (Shee et al., 2014). These stakeholders are uniquely placed to provide the organisation with feedback regarding patient and family member reactions (Melton & Hartline, 2010; Yang, Lee, & Cheng, 2016), and are a valuable resource in planning, implementing and ongoing modification of a service (Melton & Hartline, 2010). Ensuring staff are included in the planning and evaluation of a service has a positive impact on the quality of the service (Melton & Hartline, 2010) and staff attitudes and adoption of the service, which are all necessary for successful change implementation (Kotter & Schlesinger, 2008). By exploring staff perceptions regularly, ongoing modifications can be made to ensure the smooth running of the service and maximise patient outcomes (Donaldson & Finch, 2012).

A survey completed in 1987 of clinical managers and administrators in rehabilitation hospitals in the USA with 20 beds or more, investigated the problems and benefits of providing a weekend service (Hooper & Dijkers, 1987). Respondents reported weekend

services were most commonly implemented to increase hospital utilisation, reduce LOS and prevent patient boredom (Hooper & Dijkers, 1987). The most significant problems reported included staffing costs, staffing coverage and recruiting, as well as providing physiotherapy services around patient weekend leave (Hooper & Dijkers, 1987). No information was provided on the facilitators required to provide a weekend service in rehabilitation, which would be helpful for facilities wanting to implement weekend rehabilitation services. The reported benefits to weekend therapy included improved patient care and treatment consistency, increased revenue and profitability, and improved patient/family satisfaction (Hooper & Dijkers, 1987).

With more than 30 years now elapsed since this article was published, it would be beneficial to revisit this topic to investigate current clinician perceptions of appropriateness (perceived fit or relevance of an intervention in a particular setting), acceptability (perception that the intervention is agreeable – including barriers, facilitators and benefits) and feasibility (extent intervention can be carried out in a particular setting) (Peters, Tran, & Adam, 2013) of the implementation of a weekend service in rehabilitation settings in Australia. Involving staff in the implementation of a new service is key to the success and effectiveness of a new service (Shee et al., 2014), and may assist facilities with staff acceptability (by addressing barriers and improving facilitators) when implementing a new service in rehabilitation in the future. While managerial perspectives have been investigated, albeit over 30 years ago, there has only been one study that has investigated patient perspectives of weekend rehabilitation service provision (Ruff et al., 1999). This study simply enquired as to whether participants preferred 6- or 7-day therapy in rehabilitation (Ruff et al., 1999). Patient perspective is

important, but was not included in the suite of studies in this thesis as it was considered beyond the scope of feasible studies for this thesis. Further discussion of this issue will be presented in Chapter 9.

2.1.6.6 Outcomes of weekend service provision in rehabilitation

Weekend service provision in rehabilitation has been found to have several benefits. The following sections explore the impact of weekend therapy provision in rehabilitation on service (LOS, economic impact and patient flow) and patient outcomes (functional independence, gait and balance etc.).

2.1.6.6.1 Service outcomes

As outlined in Section 2.1.6.1, additional weekend rehabilitation therapy has shown a trend for a reduction in LOS from one to five days (Brusco et al., 2007; DiSotto-Monastero et al., 2012; English et al., 2015; English et al., 2016; Peiris, Shields, et al., 2013). The lack of statistical significance in each study is likely influenced by the wide range of LOS reported within a study (English et al., 2016). Despite this lack of statistically significant findings, LOS reductions of up to five days may be clinically relevant. Reduction in LOS is a high priority for health care providers and can be a sign of increased efficiency of services (Clarke & Rosen, 2001). Shorter LOS has significant benefits for both patients and health services, as patients can return home sooner, enabling faster flow through of patients in the hospital, and result in cost savings for hospitals (Brusco et al., 2007; English et al., 2016). However,

this increased efficiency and reduction in LOS must not come at the expense of quality of patient care, nor should the cost be shifted to community health services.

The economic impact of weekend service provision has also been investigated alongside the implementation of a 6-day multidisciplinary service (Peiris, Shields, et al., 2013). Likely cost savings with 6-day multidisciplinary service compared to a 5-day service have been found within a 30-day (Brusco et al., 2014), and 12-month follow up period (Brusco et al., 2015) using a cost-effectiveness analysis. Additionally, cost savings made within the hospital setting did not transfer costs to community health services (Brusco et al., 2015). A cost-effectiveness analysis compares the relative costs and outcomes of a specific intervention, and aids decisions about which health care pathway should be taken (HERC, 2016). This is completed using quality-adjusted life years.

Quality-adjusted life years are the measure of the state of health of a person in which the benefits are adjusted to reflect the QOL (NICE, 2018). One quality-adjusted life year is equal to one year of life lived in perfect health (NICE, 2018). Quality-adjusted life years were measured using the EuroQol EQ–5D questionnaire, and were used to determine the economic benefit associated with weekend service provision (Brusco et al., 2014, 2015). The EQ-5D is an instrument used to describe and value health (Herdman et al., 2011) using five dimensions – mobility, self-care, usual activities, pain/discomfort and anxiety/depression (Brooks & EuroQol Group, 1996). Respondents select one of five levels that best represents their situation for each dimension, which provides a score to determine

a health related QOL utility score (Brusco et al., 2014). This score is used to calculate an incremental cost-effectiveness ratio, representing the cost per quality-adjusted life-year gained, in order to determine the cost-effectiveness of the service implementation (Brusco et al., 2014). A saving of more than $40,000 per quality-adjusted life-year was gained at 30 days post discharge (Brusco et al., 2014), and a non-significant cost saving of over $280,000 at 12 months post discharge with the implementation of a 6-day multidisciplinary service (Brusco et al., 2015). This calculation, while very important to evaluate the long term and community impact of implementing a weekend service, does not provide information about costs for the health service providing rehabilitation.

A cost-minimisation analysis (used to determine the cost difference when two treatments are broadly equivalent) would provide economic information to the health service when new or modified services are implemented (Drummond, Sculpher, Claxton, Stoddart, & Torrance, 2015). Such analysis would determine the net value (costs of providing the service versus savings) of the new or modified service compared to the previous service. A cost-minimisation analysis may be useful for hospitals and health services wanting to investigate the economic impact of providing a weekend service, given that previous studies have already demonstrated that weekend service provision is likely cost effective and does not increase community health costs (Brusco et al., 2014, 2015). The implementation costs of weekend service delivery (cost-minimisation or cost-effectiveness analysis) has not yet been investigated in effectiveness studies of weekend service provision in rehabilitation.

Weekend service provision also appears to improve patient flow in the hospital. DiSotto-Monastero et al. (2012) reported increased weekend admissions (86% increase) and discharges (112% increase) with weekend service provision. Similarly, Hakkennes et al. (2015), found the number of Saturday admissions increasing four-fold. Enabling greater rehabilitation admissions and discharges on a weekend, may result in better flow of patients through the hospital, leading to better efficiency.

2.1.6.6.2 Patient outcomes

The impact of weekend services on functional independence has been investigated using the Functional Independence Measure (FIM), with mixed results. Significant increases in discharge FIM scores have been found with weekend service provision compared to usual weekday care (Hakkennes et al., 2015; Peiris, Shields, et al., 2013). This increased discharge FIM score was mostly maintained at 6 months post-discharge, but not at 12 months post-discharge (Peiris, Shields, et al., 2013). In contrast, other studies have found no differences in FIM scores with weekend service provision (Brusco et al., 2007; DiSotto-Monastero et al., 2012; English et al., 2015; English et al., 2016; Ruff et al., 1999). The reasons for this discrepancy in findings is unclear – the studies finding improved FIM scores provided a 6-day multidisciplinary service in mixed rehabilitation population and had similar LOS (Hakkennes et al., 2015; Peiris, Shields, et al., 2013) to studies that did not find a significant functional change on discharge (Brusco et al., 2007; DiSotto-Monastero et al., 2012; English et al., 2015; English et al., 2016; Ruff et al., 1999), provided a similar amount of therapy on the weekend, and were either stroke-specific or mixed rehabilitation populations.

Additional patient specific outcomes have been investigated with weekend therapy implementation including gait and balance outcomes, activity levels, discharge destination, adverse events, weekend admissions and discharges, and QOL. No significant differences have been found in gait and balance outcomes between rehabilitation participants who did and did not receive weekend therapy (Brusco et al., 2007; Peiris, Shields, et al., 2013; Ruff et al., 1999). While both the control and weekend therapy groups improved from admission to discharge, there was no significant difference found between the two groups, regardless of the amount of therapy participants received (approximately one additional hour on each weekend day therapy was provided) (Brusco et al., 2007; Peiris, Shields, et al., 2013), or whether weekend services provided were physiotherapy only (Brusco et al., 2007) or multidisciplinary (Peiris, Shields, et al., 2013; Ruff et al., 1999). Studies investigating gait and balance measures were all RCTs. These measures have not yet been investigated in effectiveness trials.

The impact of weekend physiotherapy service provision on patient activity levels has also been investigated. Patients with lower limb orthopaedic conditions in rehabilitation receiving 6-day physiotherapy and occupational therapy services were more active, taking 57% more steps per day compared to the 5-day group (Peiris et al., 2012a). Participants receiving Saturday therapy took double the number of steps on a Saturday, and in the days following this Saturday session these participants took 63% more steps per day compared to participants receiving 5-day service (Peiris et al., 2012a). However, it must be noted that slightly more participants receiving 6-day therapy were independent with mobility at

baseline compared to participants receiving 5-day therapy. Patient activity levels have not been investigated in 7-day rehabilitation service provision.

The addition of weekend therapy appears to have no impact on discharge destination (Brusco et al., 2007) or the number of adverse events (Brusco et al., 2007; English et al., 2015; Peiris, Shields, et al., 2013) suggesting there was no additional risk to patient safety with the implementation of a weekend service. Health related QOL, measured using the EQ-5D questionnaire, was also found to improve at discharge and six month follow up (but not 12 month follow up) in participants receiving weekend therapy compared to usual 5-day care (Peiris, Shields, et al., 2013).

These results show a largely positive picture of the impact of weekend service provision on service and patient outcomes, with likely clinically important improvements in LOS, weekend admissions and discharges, reduced hospital costs, QOL, and increased patient activity, with no change in adverse events. Determining the optimal service delivery model to achieve these benefits and whether these are appropriate with real world implementation of weekend rehabilitation services requires investigation.

2.1.7 Framework for studies within this thesis

In order to best determine how a 6-day service is provided in a real world context, an effectiveness-implementation hybrid design will be used across this thesis (Curran et al., 2012). An effectiveness-implementation hybrid approach combines elements of both

effectiveness and implementation research to investigate the effectiveness of an intervention, and the implementation strategy used to put this intervention into practice (Peters, Tran, et al., 2013). It is thought that the blending of the clinical effectiveness and implementation research components is both desirable and feasible, leading to faster clinical translational gains, more effective implementation and provides both researchers and decision makers with more useful information (Curran et al., 2012).

As outlined in Section 2.1.6.1, RCTs are the gold standard research design for determining how specific interventions affect health. RCTs are concerned with investigating the efficacy of an intervention, however due to their implementation and design factors, RCTs have limitations in guiding clinical practice and policy about these interventions (Wells, 1999). In order to determine the effects of interventions outside these rigorous settings, clinical effectiveness trials are required. Clinical effectiveness trials tend to have more heterogenous study populations and locations, and investigate the effect of an intervention on a wider range of clinical and other outcomes (e.g. QOL, costs) (Curran et al., 2012), under 'real world' conditions similar to usual care (Glasgow et al., 2003; Wells, 1999). This framework will be used in the current thesis in order to determine the effectiveness of a 6-day rehabilitation service in a real world setting.

Implementation research describes the study of the processes used when implementing initiatives and the contextual factors affecting this (Peters, Tran, et al., 2013). It aims to understand how initiatives work in real world conditions, without controlling for contextual factors or removing influences that may affect how the intervention is implemented (Peters, Adam, Alonge, Agyepong, & Tran, 2013). An important aspect of implementation research

is that stakeholders should be involved in the identification, design and conduct phases of the research. Due to the changing nature of implementation activities, research designs need to be able to observe and analyse these changing elements at several points in time, and therefore consider unintended consequences. Implementation research utilises outcomes to improve understanding of the implementation process and the efficiency of implementation research (Peters, Tran, et al., 2013). These outcome variables and how they relate to the studies in this thesis are outlined in Table 2-3.

Both effectiveness and implementation are important to be investigated when determining how weekend rehabilitation services can be implemented in real world environments effectively. Studies investigating both these elements fit into the Hybrid 1 Type framework proposed by Curran and colleagues (2012), which has been used in complex interventions in many aspects of health research. The Hybrid Type 1 model involves investigating the effectiveness of a clinical intervention while collecting information on the delivery of this intervention or its potential for implementation into a real world situation. This enables research questions regarding acceptability (staff perspectives, barriers and facilitators) to real world implementation, problems associated with delivery of the intervention during the clinical effectiveness trial, and potential modifications to the clinical intervention to maximise implementation.

*Table 2-3: Implementation outcome variables, definitions and relation to thesis**

Implementation outcome	Working definition	How applies to thesis
Acceptability	Perception among stakeholders (e.g. consumers, providers, manager, policy makers) that an intervention is agreeable	Ch. 6: Formative evaluation – staff perspectives, barriers, facilitators, strengths and improvements Ch. 7: National survey – clinician perspectives, barriers and facilitators
Adoption	Intention, initial decision or action to try to employ a new intervention	Ch. 3: Pilot study – number of facilities providing weekend rehabilitation service and service model Ch. 6: Formative evaluation – pre-implementation survey regarding how service could be implemented Ch. 7: National survey – number of facilities providing weekend rehabilitation service and service model
Appropriateness	Perceived fit or relevance of the intervention in a particular setting or for a particular audience or problem	Ch. 3: Pilot study – how weekend service implemented to determine how it could be implemented in target rehabilitation facility Ch. 6: Formative evaluation – post-implementation survey determining whether participants receiving weekend therapy were appropriate, and staff perspectives of strengths and improvements for the service
Feasibility	Extent to which an intervention can be carried out in a particular setting or organisation	Ch. 3: Pilot study – how weekend service implemented to inform service design at target rehabilitation facility; response rate of survey to determine if larger national survey feasible Ch. 6: Formative evaluation – pre-implementation survey determining what was feasible to be implemented in the facility; post-implementation survey determining strengths and improvements from service implementation
Fidelity	Degree to which an intervention was implemented as it was designed in an original protocol, plan or policy	Ch. 4, 5 and 8: number of participants allocated to weekend service that attended weekend service
Implementation costs	Incremental cost of the implementation strategy. The total cost of implementation would also include the cost of the intervention itself	Ch. 8: Cost minimisation study
Coverage	Degree to which the population that is eligible to benefit from an intervention actually receives it	Not specifically investigated
Sustainability	Extent to which an intervention is maintained/institutionalised	Not specifically investigated

*Adapted from Peter, Adam et al., 2013 and Proctor et al., 2011.

Hybrid 1 designs are proposed to be utilised under the following conditions:

1) the clinical intervention has strong face validity supporting applicability of this intervention into a new setting, population or delivery method;

2) there is a strong base of (at least indirect) evidence for the intervention that would support its applicability into a new setting, population or delivery method; and

3) the intervention is associated with minimal risk.

The studies within this thesis fit the Hybrid 1 framework. The clinical intervention of implementing a 6-day rehabilitation service has been previously investigated by RCTs, establishing the efficacy and feasibility of this intervention, and is low risk. The implementation of a 6-day rehabilitation service within this thesis is also proposed to be investigated with a concurrent formative evaluation. The original content and implementation design of the intervention will be informed by a pilot survey investigating how weekend rehabilitation services have been adopted and implemented by other facilities. This information will help determine the appropriateness of weekend rehabilitation therapy in a private, metropolitan hospital setting, with the final model to be co-designed by staff members working in the rehabilitation unit. The effectiveness of a weekend rehabilitation therapy service will be examined (Study 1), then cycles of feedback from staff about the intervention and its implementation is planned via a formative evaluation (Chapter 6). This provides an opportunity to modify the intervention based on feedback. It is planned to complete two cycles of feedback, and therefore service modifications, with the final investigation to also include a cost-minimisation analysis to determine the implementation costs of providing the 6-day rehabilitation service. A

national survey of Australian rehabilitation facilities (Chapter 7) is proposed, to explore current weekend rehabilitation service adoption, as well as clinician perspectives on acceptability of weekend service provision. The formative evaluation and national survey together will provide information on acceptability and appropriateness of the provision of a weekend rehabilitation service in real world settings. This thesis provides structured information that will assist other allied health clinicians and managers, as well as hospital executives and policy makers, in how weekend allied health services can be implemented in rehabilitation in the real world, the barriers and facilitators that should be addressed and the costs involved.

2.1.8 Summary

In summary, despite the potential benefits of weekend service provision, only 30% of rehabilitation facilities in Australia provided a weekend service in 2011 (Shaw et al. 2013). Further review of current weekend service provision in Australian rehabilitation units is required to determine current levels of adoption, staffing methods, and clinician acceptability of weekend service provision. The reported benefits of weekend service provision appear to be slightly more notable with the provision of 6-day rehabilitation services compared to 5- or 7-day services, and include a trend for a reduced LOS (Brusco et al., 2007; Peiris, Shields, et al., 2013), increased patient independence and activity levels (Peiris, Shields, et al., 2013; Peiris et al., 2012a), while likely being cost-effective (Brusco et al., 2014, 2015). Generally speaking, these results have been found utilising experimental designs, including RCT methodologies. It is necessary to determine if the real world

implementation of weekend rehabilitation services result in similar findings. It is reasonable, therefore, to investigate the impact of a 6-day physiotherapy service alone, as well as multidisciplinary services, implemented in a private metropolitan rehabilitation unit setting utilising prioritised patient selection to investigate service effectiveness, currency of staffing, and implementation costs of weekend service provision. Alongside these studies, it would be useful to investigate clinician perspectives regarding the implementation of a 6-day service, to determine the barriers and facilitators to implementing this service in a rehabilitation unit.

2.2 Thesis research aims and hypotheses

In light of the ageing population one potential method to achieve the increased efficiencies required within the health care system is to provide weekend rehabilitation. Recent studies have demonstrated benefits of rehabilitation weekend service provision including improved patient functional independence and QOL, and increased cost effectiveness associated with a trend towards a reduction in LOS of up to three days when compared with usual care of 5-days of therapy. There has been little evidence published investigating the real world implementation of a weekend rehabilitation service. Therefore, the overall aim of this thesis is to investigate the effectiveness of a weekend rehabilitation service in a real world environment. This will be explored through a pilot and five studies, which are presented in Figure 2-4. The research aims and hypotheses of each study are outlined below.

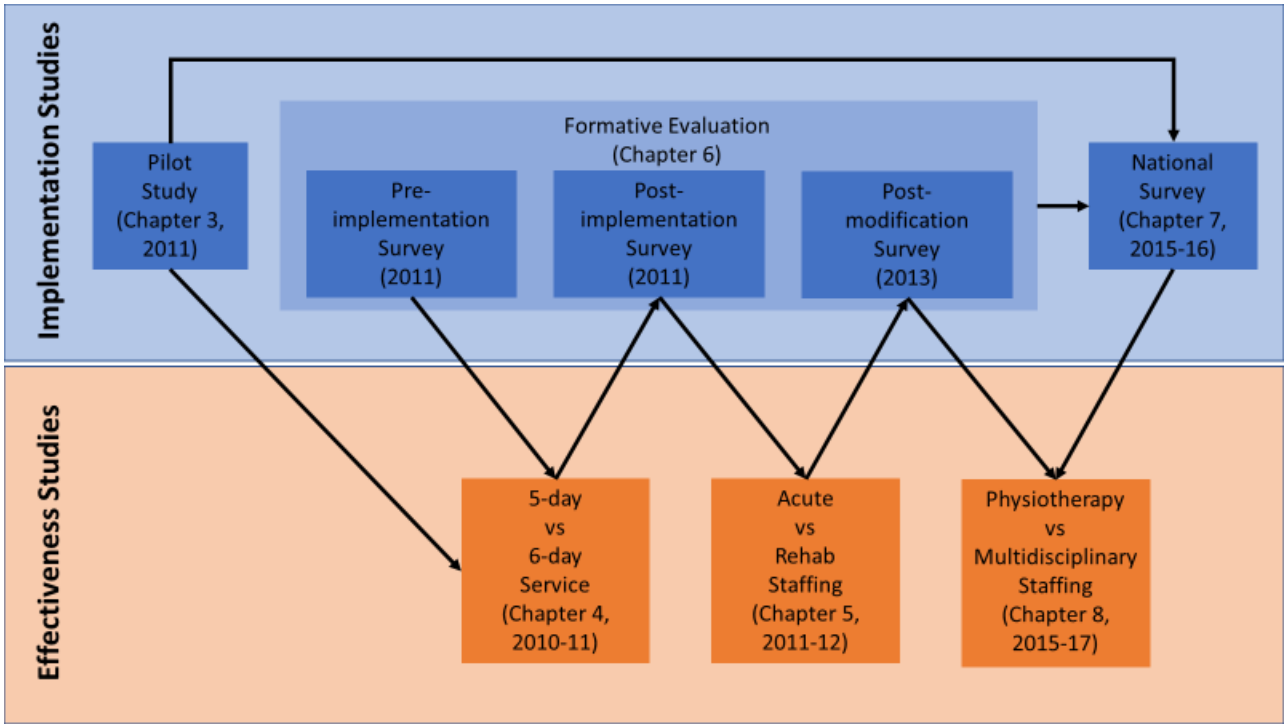

Figure 2-4: Studies included in this thesis to explore the effectiveness and implementation of weekend therapy services in rehabilitation.

The pilot study (Chapter 3), entitled 'Weekend therapy service provision in a sample of rehabilitation facilities throughout Australia' aimed to survey a purposive sample of senior physiotherapists in Australian rehabilitation facilities regarding weekend service provision, implementation, planning and evaluation to determine the feasibility of trialling a model of weekend service, and inform service provision design. It is hypothesised that rehabilitation weekend services will be most commonly provided in metropolitan rehabilitation facilities, and staffed with physiotherapists more than multidisciplinary staffing. It is also hypothesised that rehabilitation facilities will have undertaken some form of benchmarking or literature review prior to implementing the weekend service, and that these services will have been evaluated to determine the impact of weekend service delivery.

Study 1 (Chapter 4), 'A pragmatic implementation of a 6-day rehabilitation service in a mixed inpatient rehabilitation unit' aimed to determine if adding a 6-day physiotherapy service in a rehabilitation unit for eligible patients resulted in a change in LOS, functional independence and measures of gait and balance, when compared to a usual 5-day service. It is hypothesised that the addition of a 6-day physiotherapy service will result in a reduction in LOS and improve functional independence as well as gait and balance measures compared to a 5-day service.

Study 2 (Chapter 5), 'The impact of staffing model in a 6-day rehabilitation physiotherapy service' aimed to determine whether staffing a rehabilitation weekend physiotherapy service with physiotherapists currently working in rehabilitation leads to improved patient outcomes (LOS, functional independence, gait and balance) compared to a service staffed with physiotherapists working in acute wards. A secondary aim was to determine if these outcomes differed between diagnostic groups. It is hypothesised that staffing the 6-day service with rehabilitation staff members will lead to improved patient outcomes compared to a 6-day service staffed with acute physiotherapists. It is also hypothesised that different diagnostic groups will respond differently to weekend physiotherapy provision.

Study 3 (Chapter 6), entitled 'Implementing a 6-day physiotherapy service in rehabilitation – exploring staff perceptions', aimed to investigate staff perceptions on service provision, barriers and facilitators, and the perceived impact of a 6-day service on LOS and goal attainment with the implementation of various forms of 6-day service delivery. It is hypothesised that staff will initially have some reservations regarding the implementation of

a 6-day rehabilitation service and may identify a large number of barriers, but that these barriers will decrease over time. It is also hypothesised that staff will perceive that the 6-day service will reduce LOS, but will have varying impacts on goal attainment.

Study 4 (Chapter 7), 'Allied health weekend service provision in Australian rehabilitation units' aimed to investigate current rehabilitation weekend service provision in Australia, and staff perceptions of barriers and facilitators to providing this service. It is hypothesised that weekend service provision will be increased from the findings of the previous national survey (Shaw et al., 2013). It is again hypothesised that weekend service provision will be higher in metropolitan areas, and most commonly staffed by physiotherapists. It is hypothesised that financial and staffing reasons will be the biggest barriers to weekend service provision, but that clinicians will generally be supportive of weekend services in rehabilitation.

Finally, Study 5 (Chapter 8), 'Multidisciplinary 6-day rehabilitation service – a pragmatic implementation' aimed to investigate the effectiveness of a 6-day multidisciplinary service on LOS, functional independence, patient outcomes and economic impact when compared to a 6-day physiotherapy-only service in a real world setting. It is hypothesised that the provision of a multidisciplinary 6-day service will result in greater reductions in LOS than found in the previous studies in this thesis. It is also hypothesised that the multidisciplinary 6-day service will improve functional independence, but may not impact gait and balance outcomes. It is hypothesised that the 6-day multidisciplinary service will lead to cost savings compared to the 6-day physiotherapy-only service.

Chapter 3 – Pilot study – Weekend therapy service provision in a sample of rehabilitation facilities throughout Australia

Abstract published in *Physiotherapy* (2015) 101(Supplement 1): e200 - e201.

Evidence suggests that weekend therapy service provision is widespread in the acute sector, across different populations. However, there is no recent data indicating current rates of weekend therapy service provision in rehabilitation in Australia. This chapter will investigate current weekend therapy service provision in a purposive sample of Australian rehabilitation facilities using an electronic survey to characterise weekend therapy service provision. This will provide information on current weekend rehabilitation services and assist in determining if trialling a weekend therapy service in rehabilitation might be feasible.

3.1 Abstract

Aim: This study aimed to survey a purposive sample of senior physiotherapists in Australian rehabilitation facilities regarding weekend service provision, implementation, planning and evaluation to determine the feasibility of trialling a model of weekend service and inform service design.

Methods: Surveys were distributed to senior rehabilitation physiotherapists at 36 purposively selected inpatient rehabilitation facilities exploring current weekend service provision, staffing, research undertaken prior to implementation and outcomes of this service. Open and closed-ended questions were included in the survey.

Results: Twenty-four surveys (67% response rate) were returned. Weekend therapy services were provided by 63% of rehabilitation facilities surveyed. More private rehabilitation facilities (n=11) offered weekend services than public (n=4). Weekend services were most commonly staffed by physiotherapists (with or without an assistant). Services were evenly split between half and full day services. Each rehabilitation facility had a unique rostering practice. Service planning and evaluation were not routinely completed.

Conclusion: Over half of rehabilitation facilities surveyed provided a weekend service, suggesting that facilities have found it feasible to implement. Variation exists in weekend rehabilitation therapy provision with services mainly provided by physiotherapists in private metropolitan hospitals using a 6-day model, suggesting this might be the most appropriate model to trial.

3.2 Introduction

A systematic review completed in 2011 found that increased physiotherapy treatment time, even as little as 19 minutes of extra therapy time per day can reduce inpatient hospital LOS in acute or rehabilitation patients and increase the rate of improvement in walking ability, activity and QOL (Peiris et al., 2011). However, there has been no evidence as to how this extra therapy should be provided to achieve these benefits.

One method of increasing physiotherapy treatment time is providing weekend services. The majority of the literature investigating weekend physiotherapy service focuses on patients in acute care settings, as outlined in section 2.1.5. There is emerging evidence that providing a weekend service in rehabilitation settings is also beneficial (see Section 2.1.6). At the time this pilot study was conceived (2011), there had only been two studies investigating the efficacy of weekend therapy services on LOS and patient outcomes (Brusco et al., 2007; Ruff et al., 1999). These studies found a trend for a reduction in LOS by 3.2 days with 6-day physiotherapy provision (Brusco et al., 2007), with no difference in LOS between a 6- and 7-day multidisciplinary service provision in rehabilitation (Ruff et al., 1999). Additionally, no difference was found in functional independence or other measures of gait and balance (Brusco et al., 2007; Ruff et al., 1999). The study investigating 6-day service provision utilised RCT methodology and explored this in a mixed public rehabilitation facility, with participants excluded from the study if they demonstrated cognitive impairment (Brusco et al., 2007), while the 7-day service was investigated in the stroke population, using a quasi-randomised service design (Ruff et al., 1999). No studies had

investigated the effectiveness of rehabilitation weekend service provision in a real world context, nor had this been investigated in the private hospital sector, without limitations on the demographics included. The evidence from these studies, in combination with the Australasian Faculty of Rehabilitation Medicine guidelines that rehabilitation should be provided on a minimum of five days a week (Australasian Faculty of Rehabilitation Medicine, 2011), and the possibility of pressure from private health insurers for private hospitals to provide weekend therapy, prompted the need to investigate current service provision of weekend services in rehabilitation facilities around Australia.

Prior to this pilot study only one survey of the perspectives of staff on weekend therapy service provision had been published over 25 years prior (Hooper & Dijkers, 1987). Administration and management staff in the USA were surveyed. Approximately 82% of rehabilitation units responding to the survey provided some form of weekend therapy, with physiotherapy (67%) and occupational therapy (51%) the most commonly provided allied health disciplines. Weekend therapy services were most commonly implemented to increase facility utilisation, decrease LOS and prevent patient boredom. Of the facilities providing a weekend service, 71% of respondents observed that patients received more therapy with weekend service provision, however 51% of respondents perceived no effect on LOS. The most commonly reported benefits of weekend service provision were improved patient care and treatment consistency, and improved revenue and profitability. Barriers reported by respondents included staffing cost and staff coverage, as well as interference with patient leave (Hooper & Dijkers, 1987).

When implementing a new service, it is important to gain staff perspectives in order to develop staff support for the adoption and success of the new service (Melton & Hartline, 2010; Yang et al., 2016). Therefore, surveying senior staff, rather than allied health managers may provide more accurate information on the acceptability of weekend therapy services provided in rehabilitation. In order to optimise the success of a new service, it is important that prior research is carried out. Completing a literature review may provide information on the efficacy and effectiveness of the provision of the new service, while a benchmarking survey of other similar facilities may present service provision options and their strengths and weaknesses. This can help to inform service provision design. Staff involvement in the co-design of a service is also important and can increase support when implementing the new service into the workplace (Melton & Hartline, 2010). Services implemented should also be evaluated periodically post adoption, in order to determine their appropriateness, feasibility and impact, and whether the service requires modification.

This study was completed to inform the implementation of a weekend rehabilitation service at a 40-bed mixed rehabilitation unit in a private, metropolitan hospital. This facility was planning on implementing a weekend service, and due to the limited evidence available in the rehabilitation sector, thought it was necessary to survey other facilities as to how this service could be provided. Therefore, the aim of this pilot study was to survey a purposive sample of senior physiotherapists in Australian rehabilitation facilities regarding weekend service provision, implementation, planning and evaluation to determine the feasibility of trialling a model of weekend service, and inform service design.

3.3 Methods

A cross-sectional study design using an electronic survey was used to explore weekend service delivery in a purposively selected sample of Australian inpatient rehabilitation facilities in 2011.

3.3.1 Participants

Senior rehabilitation physiotherapists were contacted at 36 inpatient rehabilitation facilities across Australia. A sample of metropolitan and regional rehabilitation facilities from around Australia were purposively chosen to gain a national sample of rehabilitation facilities, both privately and publicly funded, across most states in Australia. Consent to participate in this survey was deemed implicit with the return of a completed survey. Institutional ethical clearance was not required as this survey was completed as a quality assurance project (NHMRC, 2014).

3.3.2 Survey development

The full version of the survey distributed can be found in Appendix 2a. A combination of closed and open-ended questions were used to investigate current service provision in rehabilitation facilities. The survey requested demographic information of the facility such as types of patients admitted, funding source, total bed numbers, and whether a weekend rehabilitation service was provided. Open and closed-ended questions were used to gain information from rehabilitation facilities providing a weekend rehabilitation service on their

current weekend service provision, how it is implemented, including number of days and hours the service is provided, staffing levels, disciplines, staffing model, employment status of staff (permanent or specifically recruited for the service) and rostering. Number of patients treated by the weekend service and eligibility criteria used to determine who received weekend therapy was also investigated via open-ended questions. The survey also explored whether any prior benchmarking had been carried out, as well as any evaluation of the weekend service. Survey questions were developed partly from Hooper and Dijkers' (1985) survey, but primarily to answer questions to aid in the development of a service. Feedback was sought from physiotherapists in the target rehabilitation unit regarding content, clarity, usability and appropriateness of questions. Amendments were made to the survey to ensure it best facilitated responses to the above research questions.

3.3.3 Data analysis

Descriptive statistics were undertaken for closed-ended questions reporting frequencies, means and standard deviation (SD) as appropriate including percentage of respondents, frequency providing a weekend rehabilitation service, bed numbers, number of patients receiving the rehabilitation weekend service, and staffing. Kruskal-Wallis testing was utilised to compare hospital bed numbers between publicly and privately funded rehabilitation facilities. Statistical Package for the Social Sciences (SPSS) (version 22, Chicago, IL) was used to complete statistical analysis and statistical significance was set at $p < 0.05$. Open-ended questions were summarised for content.

3.4 Results

3.4.1 Respondents

Twenty-four of the 36 inpatient rehabilitation facilities surveyed responded resulting in a response rate of 67% (Table 3-1). Thirteen rehabilitation facilities (54%) were publicly funded, with the remaining 11 respondents from private facilities (46%). Inpatient rehabilitation bed numbers ranged from 10 to 132, with a mean of 46 beds (SD 29). The majority of units (n=21, 83%) had more than 20 beds. Private rehabilitation facilities appeared to have higher average bed numbers (49 beds, SD 21) compared to public facilities (43 beds, SD 35), although this was not statistically significant (p = 0.233). The most common populations treated at the responding rehabilitation facilities included orthopaedic, neurological and those requiring general rehabilitation (each treated in 83% of facilities), followed by geriatric (63%), amputee (58%) and acute brain injury (54%) populations. Other populations of patients that rehabilitation facilities treated included burns, pain, cardiac, pulmonary, central nervous system tumours and vestibular conditions.

3.4.2 Provision and implementation of service

Nine rehabilitation facilities (38%) provided a 5-day service, nine facilities (38%) provided a 6-day service, and six facilities (24%) provided a 7-day service. The majority of rehabilitation facilities providing a weekend rehabilitation service were private (n=11, 73%). None of the private facilities surveyed provided a 5-day service. The average number of beds for those facilities providing a weekend service of 6-days was 54 beds (SD 22), higher than

Table 3-1: Rehabilitation facility demographics, number of therapy days provided and type of patients.

Demographic	Number of rehabilitation facilities n=24
Funding, n (%)	
Public	13 (54%)
Private	11 (46%)
Location, n (%)	
Queensland	14 (58%)
Other states	10 (42%)
Bed numbers, mean (SD)	
All respondents	46 (29)
Private facilities	49 (21)
Public facilities	43 (35)
Therapy days provided, n (%)	
5 days	9 (38%)
Public facilities	9 (100%)
Private facilities	0 (0%)
6 days	9 (38%)
Public facilities	2 (22%)
Private facilities	7 (78%)
7 days	6 (24%)
Public facilities	2 (33%)
Private facilities	4 (67%)
Diagnostic mix of facility, n (%)	
Geriatric	15 (63%)
Neurological	20 (83%)
Orthopaedic	20 (83%)
Acute brain injury	13 (54%)
Spinal Injury	9 (38%)
Amputee	14 (58%)
General	20 (83%)
Other	8 (33%)

n = number, SD = standard deviation

rehabilitation facilities providing a 5-day service (29 beds, SD 21) ($p = 0.026$). There was no significant difference in bed numbers between facilities providing a 7-day service (48 beds, SD 18) or a 5-day service ($p = 0.097$).

Table 3-2 illustrates the staffing, including disciplines and hours, provided during weekend service delivery. The majority of rehabilitation facilities providing a 6-day service staffed this with a physiotherapy and physiotherapy assistant combination (n=7, 78%). Only one facility provided a multidisciplinary 6-day service, staffed with physiotherapy, occupational therapy and social work as required. The 7-day service delivery differed between days. On Saturday, the service was most commonly delivered by a physiotherapist and physiotherapy assistant (83%) and occupational therapist and occupational therapy assistant (50%). Four facilities provided a multidisciplinary service on a Saturday, with three facilities providing physiotherapy and occupational therapy, and one facility providing physiotherapy, occupational therapy, speech pathology and social work. On Sunday, physiotherapy was the most common service, provided equally by physiotherapists, physiotherapy assistants or a combination (n = 4, 67% for all). Two rehabilitation facilities provided a service run solely by a physiotherapy assistant on a Sunday. Three facilities provided a multidisciplinary Sunday service, two facilities providing this with physiotherapy and occupational therapy, and one providing physiotherapy, occupational therapy and speech pathology.

The average hours of therapy provided on a Saturday of a 7-day service was greater than that provided on a Sunday, or in a 6-day service; regardless of discipline, although this was not statistically significant ($p > 0.225$). Average physiotherapy and physiotherapy assistant hours on a Saturday of a 7-day service were both greater than 10 hours each, with occupational therapy service greater than eight hours. Five rehabilitation facilities (55%)

Table 3-2: Staffing of weekend services by rehabilitation facilities.

	Rehabilitation facilities providing 6-day service (n=9)	Rehabilitation facilities providing 7-day service (n=6)	
		Saturday	Sunday
Disciplines involved, n (%)			
PT	4 (44%)	2 (17%)	2 (33%)
PTA	-	-	1 (17%)
PT + PTA	5 (56%)	4 (83%)	2 (33%)
OT	1 (11%)	1 (17%)	1 (17%)
OTA	-	-	2 (33%)-
OT + OTA	-	3 (50%)	1 (17%)
SP	-	1 (17%)	1 (17%)
SW	1 (11%)	1 (17%)	-
AHA	2 (22%)	-	1 (17%)
Hours/day for each discipline, mean (SD)			
PT	8.7 (6.6)	12.7 (11.8)	5.4 (3.3)
PTA	7.6 (1.14)	11.9 (7.2)	8.8 (2.2)
OT	4 (0)	8.8 (5.6)	5.8 (2.5)
OTA	-	6.3 (2.0)	3.5 (0)
SP	-	7.5 (0)	3.5 (0)
SW	3 (0)	7.5 (0)	-
AHA	3 (0)	-	3 (0)
Number of patients treated, mean (SD)	32 (23.1)	33 (22.1)	23 (17.7)
Percentage of total bed number treated for each service	59%	70%	55%
Hours provided, n (%)			
All Day	4 (45%)	4 (66%)	3 (50%)
Half Day	5 (55%)	2 (33%)	3 (50%)
Staffing, n (%)			
Additional permanent shift	1 (11%)	0 (0%)	
Casual staff	3 (33%)	3 (50%)	
Combination	3 (33%)	3 (50%)	
Other	2 (22%)	0 (0%)	

AHA = allied health assistant, n = number, OT = occupational therapist, OTA = occupational therapy assistant, PT = physiotherapist, PTA = physiotherapy assistant, SD = standard deviation, SP = speech pathologist, SW = social worker

Other = permanent staff rostered and receiving day off in lieu

providing a 6-day service provided a half day service, while the 7-day services were fairly evenly distributed between half and full day services. One facility provided a full day service on a Saturday and a half day service on the Sunday.

The majority of weekend rehabilitation services (10 facilities, 67%) were staffed with casual staff working weekend shifts, permanent staff working additional weekend shifts, or a combination of both (see Table 3-2). Four facilities (27%) used staff preferences to roster their weekend service, while two facilities (13%) use a rotational roster. Some facilities reported that they considered cost to run the weekend service, experience of staff working weekend shifts, staff burnout and continuity of care when staffing their weekend service.

Across all of facilities, a variety of different eligibility criteria were used to determine who could receive weekend rehabilitation service. The most common methods used to determine which patients received weekend therapy (Table 3-3) were based on prioritised need determined by weekday physiotherapists (used by 50% of facilities), new admissions on Friday or Saturday (40%), patients that would deteriorate without therapy (40%) and all patients (33%). These methods were used across both 6- and 7-day services, and most facilities utilised several criteria to determine patient eligibility for weekend therapy.

3.4.3 Service planning and evaluation

Approximately half of the rehabilitation facilities (n=8, 57%) had not carried out any benchmarking or literature reviews prior to the provision of their weekend service (one rehabilitation facility did not respond). Of the six facilities (42%) that had completed related research prior to implementation of their weekend service, three facilities stated this occurred many years ago, two facilities used surveys either of other facilities or patient satisfaction, and one facility carried out a literature review.

Table 3-3: Eligibility criteria used to determine patient selection for weekend service.

Selection criteria	Number of rehabilitation facilities utilising selection criteria*			
	6-day service	7-day service		Total
		Saturday	Sunday	(n=14)**
Priority driven	3	2	2	7 (50%)
New admissions Friday or Saturday	3	1	2	6 (40%)
Deteriorate without therapy	1	2	3	6 (40%)
All patients	2	2	1	5 (33%)
Short length of stay		1	1	2 (13%)
Compliant patients	-	1	1	2 (13%)
Requiring chest physiotherapy	-	1	1	2 (13%)
All neurological	-	1	1	2 (13%)
Detailed protocol (but not explained)	1	-	-	1 (7%)
Private patients	1	-	-	1 (7%)
Doctors request	1	-	-	1 (7%)

*Facilities could have reported more than one selection criteria. **Data collected for all responses provided. One facility did not provide details. n = number.

Table 3-4: Methods of evaluation used by rehabilitation facilities providing weekend rehabilitation services (n, %).

Data collected to determine effectiveness of weekend service provision	Number of facilities (n=13)*
Nil data collected	7 (55%)
Satisfaction	
Patient/staff satisfaction surveys	3 (23%)
Service	
Statistics	1 (8%)
Incident reports on weekends	1 (8%)
Length of stay	4 (31%)
Comparisons of before 6-day service to after 6-day service	1 (8%)
Patient Data	
AROC data and FIM scores	1 (8%)
Progression of treatments	1 (8%)
Physiotherapy outcome measures	1 (8%)

AROC = Australasian Rehabilitation Outcomes Centre, FIM = Functional Independence Measure
*Two rehabilitation facilities did not respond

Similarly, approximately half of the rehabilitation facilities had not formally evaluated the impact of their weekend service (n=8, 53%) (two rehabilitation facilities did not respond). Five rehabilitation units (38%) specifically collected data to evaluate the service (Table 3-4). The most common data collected for evaluation of the weekend service included LOS (31%) and patient/staff satisfaction (23%).

3.5 Discussion

In a purposively selected sample of rehabilitation facilities around Australia, approximately two-thirds of the hospitals surveyed provided a weekend rehabilitation service. The majority of facilities offering a weekend service were private facilities. Weekend services were provided by physiotherapy (with or without a physiotherapy assistant) at the majority of facilities (67%), with a small number of facilities providing other allied health services (33%). These findings suggest that this method of service delivery may be a feasible way to implement a weekend service into a rehabilitation unit.

This survey aimed to determine the feasibility of implementing a weekend service in a private metropolitan rehabilitation facility, with 40-beds, treating a mixed rehabilitation caseload. Approximately two thirds of the facilities surveyed in this study provided weekend therapy. All the private facilities surveyed provided some form of weekend service. This high adoption rate of private facilities implies that implementing a weekend service in a private rehabilitation facility is both appropriate and feasible. Only two facilities

providing a weekend service were located outside of a capital city, indicating that providing a weekend service in a metropolitan rehabilitation facility is appropriate. The average number of beds at facilities providing a weekend service was between 48 (7-day service) and 54 beds (6-day service). This is slightly higher than the bed numbers at the targeted facility with 40 beds, however the target facility is larger than the average bed numbers of those facilities providing a 5-day service (29 beds). Patient diagnostic caseload at the targeted facility appeared to be similar to responding facilities who indicated a mixed caseload, with neurological, orthopaedic, general and geriatric populations being the most common. These findings suggest that adoption of a weekend service at the targeted facility would be feasible.

This survey provides information on the most common model of weekend service provision. The majority of facilities providing a weekend service implemented a 6-day model. Of the facilities providing a 6-day weekend service, 64% were private facilities. Therefore, it seems appropriate to for the target facility to adopt a 6-day service. The majority of facilities providing a weekend service utilise physiotherapy staffing (with or without a therapy assistant). Only five facilities provided a multidisciplinary weekend service, with the most common model of this being a combination of physiotherapy and occupational therapy. Therefore, it seems appropriate to first implement a weekend service staffed with physiotherapy (with or without an assistant), with the future possibility of adding occupational therapy into the service, should it be successful.

Rehabilitation facilities differed in the way that weekend services were staffed. Variation between facilities existed in duration of service, staffing and rostering practices. Just over half of the facilities providing a 6-day service utilised a half-day model, while 7-day services similarly provided both half- or full-day service models. The majority of facilities used either permanent, casual or a combination of these to staff their weekend service. No information was provided as to whether the staff providing the weekend service had skills and expertise in rehabilitation, which in acute stroke populations, has resulted in improved outcomes for patients (National Stroke Foundation, 2010). This variation may indicate that the duration and staffing of services is required to be tailored to individual facilities and based on bed numbers, departmental staffing model and other weekend services provided at that facility. For example, a facility with a larger number of beds may be required to provide a full-day service, compared to a smaller facility where only a half-day service would be more feasible. Similarly, a facility that has a largely permanent weekday workforce may find it is more appropriate to staff their weekend service with permanent staff, compared to a facility that has a number of casual employees who are more easily able to fill weekend shifts. From this data, it seems feasible to implement a 6-day, half-day service staffed in a manner that is tailored to the departmental staffing model at the target facility. Different staffing models could then be explored if the weekend service provision is deemed successful.

There was also variability in the selection criteria used by facilities to determine patient allocation to rehabilitation weekend services. The most common criteria used were priority driven, new patients admitted to the facility on a Friday or Saturday, patients that would deteriorate without therapy over the weekend, or all patients. While it would be ideal to

provide weekend services to all patients, acute weekend services are generally provided with less staffing and fewer hours of service compared to weekday services. While this was not investigated in this survey, it is likely that reduced weekend staffing would also be the case for rehabilitation weekend services. Therefore, the utilisation of criteria to allocate patients to rehabilitation services is more likely, and would be feasible to implement at the target facility.

Less than half of the facilities had carried out any formal evaluation of the service to determine the effectiveness of the service. Those that had undertaken an evaluation of the service most commonly collected data on LOS and patient/staff satisfaction. Other data collected included patient data (AROC data and FIM scores, progression of treatments and physiotherapy outcome measures) and service data (statistics, weekend incident reports and comparison of before and after 6-day service implementation). These methods of evaluating the effectiveness of weekend service provision largely utilise data already captured in usual practice and would be feasible to monitor the effectiveness of weekend service provision in the target facility.

3.5.1 Limitations

There are several limitations related to this study. First, the sample of rehabilitation facilities recruited to this study was purposively selected. This selection was undertaken to optimise the information gained from the survey and was not designed to provide data on national rates of weekend service provision in Australian rehabilitation facilities. Second,

only two-thirds of surveyed facilities responded to the survey. While survey response rates limit generalizability of the findings (Baruch, 1999), non-responders were contacted via email in an attempt to maximise the response rate. Third, weekday staffing practices of the hospital including rostering were not explored in the survey. Therefore, it was not possible to establish differences between weekdays and weekends allied health services.

3.6 Conclusion

In conclusion, approximately two-thirds of hospitals surveyed provided a weekend rehabilitation service. This was mainly provided in private rehabilitation facilities, as a 6-day physiotherapy service. There is variation amongst facilities as to how weekend rehabilitation services are run, and criteria used to allocate patients to weekend services. Weekend services were evaluated using a variety of data to determine the impact on patient and service data as well as staff and patient satisfaction. The results of this survey have determined that implementing a weekend service in the target rehabilitation facility would be feasible, and have provided information on appropriate service design.

Chapter 4 – Study 1 – A pragmatic implementation of a 6-day physiotherapy service in a mixed inpatient rehabilitation unit

Caruana, E. L., Kuys, S. S., Clarke, J. and Brauer, S. G. (2017). A pragmatic implementation of a 6-day physiotherapy service in a mixed inpatient rehabilitation unit. *Disability & Rehabilitation, 39*(17): 1738-1743.*

There is good evidence of the efficacy of weekend service provision in rehabilitation via RCTs, and weekend services appear to be increasingly implemented in Australian rehabilitation facilities. Therefore, it is pertinent to investigate the effectiveness of weekend service provision systematically in real world settings. As two of the three RCTs investigating weekend rehabilitation service provision utilised physiotherapy services on the weekend, it is appropriate to begin investigations with a physiotherapy 6-day service. This will also be investigated in the private sector, to determine if results are similar to those found in RCTs completed in public rehabilitation facilities. The methods used to staff the service in the following study were based upon findings from the pilot (Chapter 3) as well as what was pragmatically possible in this institution.

* Minor adaptations to the paper have been made to be included in this thesis. For full paper, please see Appendix 3a.

4.1 Abstract

Aim: This study aimed to determine if adding a 6-day physiotherapy service in a rehabilitation unit for eligible patients resulted in a change in LOS, functional independence and measures of gait and balance, when compared to a 5-day service.

Methods: A prospective cohort study with historical control was undertaken in a mixed inpatient rehabilitation unit. Prospective cohort participants (2011) meeting inclusion criteria were eligible for a 6-day physiotherapy service. All other participants, including the historical cohort (2010) received usual care (5-day physiotherapy). LOS, functional independence, gait and balance performance were measured.

Results: A total of 536 individuals participated in this study; 270 in the prospective cohort (2011) with 60% receiving 6-day physiotherapy and 266 in the historical control (2010). Participants in the prospective cohort showed a trend for reduced LOS (1.7 days, 95%CI -0.53 to 3.92) compared to the historical control. Other measures showed no significant differences between cohorts. In the prospective cohort, those receiving 6-day physiotherapy were more dependent and had a longer LOS but showed significantly improved functional independence and balance compared to those receiving 5-day physiotherapy ($p < 0.040$).

Conclusion: Implementing a 6-day physiotherapy service in a 'real world' rehabilitation setting demonstrated a trend towards reduced LOS, and improved functional gains. This service could lead to cost-savings for hospitals and improved patient flow.

4.2 Introduction

A recent systematic review has shown that increasing the amount of physiotherapy received in the hospital setting is beneficial to patients (Peiris et al., 2011). Nineteen minutes of extra physiotherapy per day reduced LOS, increased QOL and improved walking activity achievement rates in patients with acute and subacute conditions (Peiris et al., 2011). The review identified a range of strategies used to increase physiotherapy time.

One strategy to increase physiotherapy time was to increase the number of days per week physiotherapy services were provided. Recent studies investigating weekend service provision in Australia and Canada found that more than 90% of large, metropolitan, acute hospitals provide a weekend service (Campbell et al., 2010; Shaw et al., 2013). However, this is less common in the subacute setting; with only 30% of Australian rehabilitation facilities providing a weekend service, and 12% of facilities providing services on both weekend days (Shaw et al., 2013). Based on the results of the pilot study (Chapter 3), this number looks to be increasing.

The impact of weekend rehabilitation physiotherapy has been investigated by several studies, finding some benefits. Six-day rehabilitation services have resulted in significant improvements in functional independence, QOL (Peiris, Shields, et al., 2013), physical activity levels (Peiris et al., 2012a), weekend admissions (DiSotto-Monastero et al., 2012 Hakkennes et al., 2015) and are likely cost effective (Brusco et al., 2014, 2015) with no

increase in adverse events reported (Brusco et al., 2007; Peiris, Shields, et al., 2013). No studies have found a statistically significant reduction in LOS (Scrivener, Jones, Schurr, Graham, & Dean, 2015), however, it could be argued that reductions of up to 3.2 days demonstrated in 6-day physiotherapy (Brusco et al., 2007) and multi-disciplinary services (Peiris, Shields, et al., 2013) may be clinically significant, and lead to cost-savings for hospitals. Similarly, no significant changes in specific measures of gait and balance have been found with weekend physiotherapy (Brusco et al., 2007), despite a recent systematic review demonstrating improved balance with additional exercise intervention (Scrivener et al., 2015). While the studies above have investigated both physiotherapy-only and multidisciplinary weekend service provision, to better understand the contribution of each profession, it is appropriate to investigate this systematically, investigating firstly the impact of a physiotherapy-only weekend service.

While findings from one RCT have been generally positive (Brusco et al., 2007), there have been no studies investigating whether these results are reproducible in a real world application of 6-day rehabilitation physiotherapy service provision. To date there has only been one RCT investigating 6-day physiotherapy service provision. This was investigated in a mixed rehabilitation facility, with all participants in the intervention group, except those with cognitive impairment, receiving weekend therapy delivered by a hospital physiotherapist (Brusco et al., 2007). In 'real world' practice, due to resource limitations, patients receiving acute weekend physiotherapy are prioritised using eligibility criteria to identify and select appropriate patients (Campbell et al., 2010; McGlinchey & Davenport,

2015). It is reasonable to suggest that a similar approach would be used if implementing weekend physiotherapy in rehabilitation, which may produce different results to those found in the RCT above.

A private metropolitan Australian hospital decided to implement a weekend physiotherapy rehabilitation service. Prior to implementation, a pilot survey (Chapter 3) of a sample of national rehabilitation facilities was completed to inform the service delivery which found that weekend services were most commonly provided in private facilities, as half-day 6-day services, staffed by physiotherapists (with or without assistants). Prioritised need, risk of deterioration and late week admissions were the most common criteria reported from the survey, used to determine who was treated by the weekend service. The information gained from this survey, combined with current literature, and a staff survey, informed the development of a 6-day physiotherapy service to investigate the impact of a 6-day physiotherapy service in a 40-bed rehabilitation unit. The aim of this study was to determine if adding a 6-day physiotherapy service in a rehabilitation unit for eligible patients resulted in a change in LOS, functional independence and measures of gait and balance, when compared to a 5-day service.

4.3 Methods

A prospective cohort study with a historical control was performed.

4.3.1 Participants

Participants were patients of a 40-bed rehabilitation unit in a private metropolitan hospital (St Andrew's War Memorial Hospital) in Brisbane, Australia. The unit treats a mixed population caseload with stroke, neurological, orthopaedic (trauma and elective), deconditioning and musculoskeletal diagnoses. All participants admitted to the rehabilitation unit between the months of April and August 2011 were eligible to participate in this study and made up the prospective cohort. Participants in this prospective cohort who met the following criteria were eligible to receive the 6-day physiotherapy service: those who in the opinion of the treating physiotherapist would deteriorate if not seen over the weekend, those admitted to the rehabilitation unit on a Thursday or Friday, provided a functional assessment had been completed, those admitted for a rehabilitation stay of less than one week, or those who in the opinion of the treating physiotherapist, were making functional gains and would benefit from additional further physiotherapy input on that weekend. Participants who required more than one person to assist for mobility were only able to be included for activities other than gait. Participants were excluded from selection for the 6-day physiotherapy service if they had consistently refused to participate in physiotherapy sessions throughout the week. All participants admitted to the rehabilitation unit between the months of July and December 2010 were used as the historical control, receiving usual care of 5-day physiotherapy. To characterise the population, demographic data was collected including age, sex, and admitting diagnosis. Ethical approval for this study was granted by the Uniting Care Health Human Research Ethics Committee and from the University of Queensland Medical Research Ethics Committee (See Appendix 1). Ethical

review determined that consent for participation in this study was not required from individual participants as the physiotherapy service was deemed to be usual practice.

4.3.2 Intervention

Usual rehabilitation care, consisting of physiotherapy and occupational therapy, with speech pathology and dietetic involvement where required, was provided to all participants in both cohorts from Monday to Friday. In addition to this, participants in the prospective cohort were eligible to receive Saturday physiotherapy, provided they met the above inclusion criteria. The Saturday physiotherapy service was developed from the results of a pilot survey of a sample of Australian rehabilitation facilities (Chapter 3), and co-designed with rehabilitation medical, nursing and allied health staff members via a survey (Pre-implementation survey in Chapter 6), meetings, inservices and discussions with senior staff members and stakeholders. These findings were compiled and provided to the allied health management team in order to finalise the structure of the 6-day service. This information was used to determine how a 6-day service could be implemented at this facility.

The 6-day physiotherapy service consisted of a four-hour service staffed by one physiotherapist, with an assistant-in-nursing staff member acting as a porter and therapy assistant. The service included a one hour orthopaedic group, and a one hour balance group, both run in the physiotherapy gym, and 1.5 hours of individual treatment sessions on the ward. Participants were allocated to individual or group physiotherapy sessions

depending on individual requirements as identified by the treating physiotherapist. Participants were allocated for individual sessions on the basis of cognition, safety and complexity of treatment. All treatment was prescribed by the treating physiotherapist in order to address individual specific goals. The remaining half hour was used for documentation and statistics. Twelve to 14 participants were treated within this period. Statistics on occasions of service, individual participant notes and staff handover documentation was reviewed by study staff to verify delivery of the intervention.

4.3.3 Outcome measures

The primary outcome measure collected was rehabilitation LOS. LOS was defined as the number of nights from admission to discharge spent in the rehabilitation unit. Secondary outcomes included functional independence (measured using the FIM), and physiotherapy measures of gait and balance: Timed Up and Go Test (TUG), 10 Meter Walk Test (10MWT), Functional Reach (FR), Step Test (right and left), Feet Together Eyes Closed (FTEC) and the Balance Outcome Measure for Elder Rehabilitation (BOOMER) tests.

The FIM has been demonstrated to be a valid and reliable measure of functional independence across a variety of patient populations and clinicians (Ottenbacher, Hsu, Granger, & Fiedler, 1996; Passalent, Tyas, Jaglal, & Cott, 2011) and has been used previously as a measure of patient outcomes in weekend rehabilitation service provision (Brusco et al., 2007; DiSotto-Monastero et al., 2012; English et al., 2015; English et al., 2016; Hakkennes et

al., 2015; Peiris, Shields, et al., 2013; Ruff et al., 1999). All allied health and nursing staff working in the rehabilitation unit were trained in the use of the FIM which is routinely collected on admission and discharge for all patients (AROC, 2013b). The TUG is a measure of functional mobility and has been found to have high intra- and inter-tester reliability in elderly populations (Podsiadlo & Richardson, 1991; Steffen, Hacker, & Mollinger, 2002), construct validity for gait speed (Steffen et al., 2002) and is a specific and sensitive measure to discriminate fallers (Isles, Low Choy, Steer, & Nitz, 2004). The 10MWT was used as a measure of gait speed and step length, and has been shown to have excellent test-retest reliability (Bohannon, 1997) and excellent interrater reliability in elderly populations (Wolf et al., 1999). It has also been positively correlated with improved mobility in elderly populations (Wolf et al., 1999), and is predictive of improvements in functional independence in people with stroke (Tyson & Connell, 2009). The Step Test is a measure of dynamic stepping balance and has excellent test-retest (Hill, Bernhardt, McGann, Maltese, & Berkovits, 1996) and interrater reliability (Hong, Goh, Chua, & Hg, 2012). FTEC is a measure of timed static balance and is a component of the Clinical Test of Sensory Interaction of Balance (Shumway-Cook & Horak, 1986). The FR measures the ability to reach outside one's base of support, and is a reliable measure of balance, with high inter-rater and test-retest reliability (Duncan, Weiner, Chandler, & Studenski, 1990; Isles et al., 2004). The BOOMER is a composite balance outcome measure consisting of the TUG, FTEC, FR and Step Test (Haines et al., 2007). It was developed from a clinician workgroup and included the main items considered representative of essential domains of standing balance construct (static, dynamic and function), which together were deemed to be essential for a global measure of standing balance (Haines et al., 2007). The BOOMER has demonstrated content

and construct validity, and among the older rehabilitation population it is a clinically applicable measure of standing balance (Haines et al., 2007). One repetition of each measure was conducted by usual therapists. These measures are carried out routinely for each patient within 24 hours of admission to and discharge from the rehabilitation unit. All physiotherapy and allied health assistant staff members were trained in the standardised collection of these outcome measures using a locally developed rehabilitation outcome measures video.

Information about utilisation of the weekend service was also collected. This included number of participants receiving the 6-day service and length of weekend physiotherapy time each participant was allocated over a participants' stay in the rehabilitation unit.

4.3.4 Data analysis

Descriptive analyses were undertaken for all measures for both cohorts. To investigate if there were any differences in outcome measures (LOS, functional independence, gait and balance) or characteristics between all participants in the prospective cohort (2011) and historical control (2010), independent t-tests or Mann-Whitney U-tests were performed. A post hoc analysis of the above was performed to compare outcome measures between 5-day and 6-day groups in prospective cohort (2011), as well as an analysis of covariance, to account for differences found in admission FIM scores. Statistical analysis was completed using SPSS (version 22, Chicago IL), and a p-value of $p < 0.05$ was used to indicate statistical

significance. A sample size calculation was completed using average LOS of 19 days for the historical control and 16 days for the prospective cohort (a reduction of three days has been found previously (Brusco et al., 2007)) with a standard deviation of 12. This indicated that 251 participants would be required in each group for a power of 0.8.

4.4 Results

4.4.1 Participants

There were 536 participants involved in this study; 270 admitted during the prospective cohort in 2011 and 266 during the historical control period in 2010. Table 4-1 illustrates the demographic and clinical details of participants admitted during both time periods. Participants were similar in terms of age, gender and diagnostic spread in the prospective (2011) and historical (2010) cohorts, and the prospective 5-day and 6-day groups ($p > 0.92$). In the prospective cohort, 162 participants (60%) received weekend physiotherapy. Ninety percent of participants who were allocated to weekend physiotherapy actually attended weekend therapy sessions. These participants received an average of 1.67 (SD 1.09) additional sessions of physiotherapy or approximately 76 (SD 43) minutes of extra physiotherapy during their stay in rehabilitation.

Table 4-1: Demographic data of participants admitted during both time periods.

Variable	Historical control (2010)	Prospective cohort (2011)		
		Total	5-day	6-day
Number of participants	266	270	108	162
Female, n (%)	174 (65.4%)	159 (58.9%)	65 (60%)	94 (58%)
Age (years), mean (SD)	78.4 (11.1)	77.0 (13.1)	75.5 (14.3)	78.0 (12.3)
Admitting diagnosis, n (%)				
Stroke	17 (6.4%)	25 (9.3%)	9 (8.3%)	16 (9.9%)
Neurological	26 (9.8%)	42 (15.6%)	19 (17.6%)	23 (14.2%)
Amputee	3 (1.1%)	4 (1.5%)	2 (1.9%)	2 (1.2%)
Musculoskeletal	13 (4.9%)	15 (5.6%)	10 (9.3%)	5 (3.1%)
Orthopaedic Trauma	79 (29.7%)	60 (22.2%)	18 (16.7%)	42 (25.9%)
Orthopaedic Elective	48 (18%)	54 (20%)	17 (15.7%)	37 (22.8%)
Reconditioning	80 (30.1%)	70 (25.9%)	33 (30.6%)	37 (22.8%)

n = number, SD = standard deviation

4.4.2 Comparing prospective and historical cohorts

A comparison of outcome measures between cohorts is presented in Table 4-2. There was no significant difference in LOS between the prospective and historical cohorts (p = 0.708, mean difference -1.7, 95% CI -3.92 to 0.53). Similarly, there was no difference between the two cohorts in FIM scores on admission (mean difference = -2.7, 95% CI -6.19 to 0.64) or discharge (mean difference = -1.12, 95% CI -4.34 to 2.11). Overall, participants demonstrated similar levels of gait and balance performance in both groups on admission and discharge. There was no significant difference between groups when comparing average change scores.

Table 4-2: Mean (SD) outcome measures for all participants for historical control and prospective cohort at admission and discharge, mean (SD) within group differences (discharge minus admission) and mean (95% confidence interval (CI)) differences between prospective and control periods.

Outcomes	Historical control (2010) Mean (SD)		Prospective cohort (2011) Mean (SD)		Historical control DC – ADM Mean (SD)	Prospective cohort DC – ADM Mean (SD)	Prospective (2011) – historical (2010) cohorts Mean difference (95% CI)
	ADM	DC	ADM	DC			
LOS, days	-	19.4 (13.4)	-	17. 7 (12.8)	-	-	-1.7 (-3.92 to 0.53)
FIM (score/126)	93.8 (19.9)	107.3 (16.8)	96.3 (19.9)	108.1 (18.2)	13.0 (12.8)	11.3 (15.4)	-1.7 (-4.09 to 0.77)
TUG (s)	31.3 (21.9)	23.6 (14.4)	28.7 (17.6)	20.2 (12.1)	11.6 (19.8)	9.4 (12.9)	-2.2 (-1.41 to 5.78)
10MWT (s)	24.1 (18.3)	19.2 (12.3)	24.1 (19.8)	17.4 (13.3)	6.7 (16.3)	7.1 (11.4)	0.2 (-3.44 to 2.60)
10MWT steps (n)	27.8 (9.1)	24.7 (7.9)	27.2 (10.1)	22.6 (6.2)	10.5 (84.5)	10.7 (78.9)	0.1 (-17.95 to 17.72)
FR (cm)	11.9 (10.7)	17.5 (10.1)	12.8 (10.5)	17.9 (10.2)	5.9 (7.8)	5.6 (7.8)	-0.3 (-1.13 to 1.7)
Right Step Test (n)	2.5 (4.0)	5.0 (4.8)	3.5 (4.4)	5.8 (5.0)	2.6 (3.6)	2.6 (3.2)	-0.0 (-0.59 to 0.68)
Left Step Test (n)	2.7 (4.2)	5.0 (4.8)	3.4 (4.4)	5.8 (5.2)	2.3 (3.3)	2.6 (3.5)	0.3 (-0.92 to 0.35)
FTEC (s)	15.1 (13.7)	22.6 (11.9)	17.2 (13.6)	24.4 (10.9)	8.0 (11.9)	7.8 (11.9)	-0.2 (-1.96 to 2.43)
BOOMER (score/16)	5 (4.6)	8 (4.4)	6 (4.8)	9 (4.6)	3 (3.0)	3 (3.3)	0.1 (-0.68 to 0.48)

ADM = admission, BOOMER = Balance Outcome Measure of Elder Rehabilitation, cm = centimetre, DC = discharge, FIM = Functional Independence Measure, FR = Functional Reach, FTEC = Feet Together Eyes Closed, LOS = length of stay, n = number, s = seconds, SD = standard deviation, TUG = Timed Up and Go test, 10MWT = 10 Meter Walk Test

Table 4-3: Mean (SD) outcome measures for participants in the prospective cohort (2011) receiving 5-day and 6-day services at admission and discharge, mean (SD) within group differences (discharge minus admission) and mean (95% confidence interval (CI)) differences between groups.*

Outcomes	5-day Mean (SD)		6-day Mean (SD)		5-day DC – ADM Mean (SD)	6-day DC – ADM Mean (SD)	6-day – 5-day Mean difference* (95% CI)
	ADM	DC	ADM	DC			
LOS, days	-	13.4 (8.0)	-	20.5 (14.6)	-	-	2.0 (-0.48 to 4.57)
FIM (score/126)	104.0 (16.8)	110.3 (19.0)	91.0 (20.3)	106.5 (17.6)	6.23 (11.8)	15.5 (14.0)	5.59 (2.43 to 8.74)
TUG (s)	22.0 (12.5)	17.4 (13.5)	33.2 (19.1)	21.7 (11.1)	5.6 (7.0)	11.6 (14.9)	4.8 (0.54 to 9.00)
10MWT (s)	21.3 (24.6)	16.5 (18.5)	26.0 (15.7)	17.9 (9.7)	5.7 (9.8)	8.0 (12.2)	1.1 (-2.72 to 4.82)
10MWT steps (n)	24.2 (7.5)	21.1 (6.0)	29.1 (11.1)	23.4 (6.2)	19.9 (129.2)	5.2 (8.6)	10.3 (-36.91 to 16.35)
FR (cm)	16.2 (10.1)	18.3 (10.6)	10.7 (10.2)	17.7 (10.0)	2.6 (5.4)	7.2 (8.4)	4.14 (1.90 to 6.38)
Right Step Test (n)	5.3 (4.8)	7.2 (5.5)	2.4 (3.8)	5.1 (4.5)	2.2 (2.7)	2.7 (3.4)	0.8 (-0.11 to 1.76)
Left Step Test (n)	5.0 (4.9)	7.2 (5.6)	2.4 (3.8)	5.0 (4.8)	2.5 (2.9)	2.7 (3.8)	0.5 (-0.55 to 1.53)
FTEC (s)	19.5 (13.2)	24.1 (11.2)	15.8 (13.6)	24.6 (10.8)	5.6 (10.4)	8.9 (12.5)	1.3 (-2.13 to 4.73)
BOOMER (score/16)	8 (5.0)	10 (5.1)	5 (4.4)	9 (4.3)	2 (2.7)	3 (3.4)	1.2 (0.20 to 2.11)

ADM = admission, BOOMER = Balance Outcome Measure of Elder Rehabilitation, cm = centimetre, DC = discharge, FIM = Functional Independence Measure, FR = Functional Reach, FTEC = Feet Together Eyes Closed, LOS = length of stay, n = number, s = seconds, SD = standard deviation, TUG = Timed Up and Go test, 10MWT = 10 Meter Walk Test

*Mean difference with covariate of admission FIM

4.4.3 Comparing 5-day and 6-day groups in the prospective cohort (2011)

A comparison of outcomes of participants receiving 5- and 6-day physiotherapy in the prospective cohort is presented in Table 4-3. When comparing the two groups within the prospective cohort, there was no significant difference in LOS, despite those who received 6-day physiotherapy appearing to have a longer LOS by a mean difference of two days. Participants in the 6-day group had significantly lower FIM scores on both admission and discharge ($p < 0.001$), and demonstrated a significantly greater change in FIM scores from admission to discharge compared to participants receiving 5-day physiotherapy service. Participants receiving 6-day physiotherapy performed at a lower level on all measures of gait and balance compared to participants receiving 5-day physiotherapy ($p < 0.040$) on admission and discharge. Participants receiving 6-day physiotherapy showed significantly greater improvements in TUG, FR, and BOOMER from admission to discharge, compared to those in the 5-day group. These significant differences remained for FIM difference, TUG, FR and BOOMER ($p < 0.027$) when admission FIM scores were accounted for as a covariate. With admission FIM scores accounted for, there was no difference in LOS between the 6-day and 5-day groups ($p = 0.112$). A clinically significant change was made in the BOOMER for the 6-day group (a change score of 3 or more) (Haines et al., 2007), but not in the 5-day group.

4.5 Discussion

Weekend physiotherapy was received by 60% of participants in the prospective cohort (2011) when eligibility criteria were specified. Participants in the prospective cohort when a 6-day service was pragmatically delivered demonstrated no significant difference in LOS, functional independence and physiotherapy measures of gait and balance, compared to the historical control (2010). Further analysis of the prospective cohort showed that those who received 6-day physiotherapy were more impaired on admission, however even when this was accounted for, greater gains in balance and functional independence were still made compared to those receiving 5-day physiotherapy, with no significant difference in LOS.

The reduction in LOS (1.7 days) found between usual care (historical control) and the 6-day therapy group in the prospective cohort in the current study did not reach statistical significance. This result is similar to other studies where all participants in the intervention group received 6-day therapy in rehabilitation (Brusco et al., 2007; Peiris, Shields, et al., 2013). However, in the prospective cohort of this study, only 60% of participants received 6-day physiotherapy. The participants receiving 6-day physiotherapy were those most fitting the eligibility criteria. It is possible that other participants were also eligible to receive the 6-day service but were limited by the half day capacity of the service. Whilst not statistically significant, a reduction in LOS of 1.7 days may be clinically significant as it may result in cost savings for the hospital. A LOS reduction of two days from the provision of a 6-day physiotherapy and occupational therapy rehabilitation service has been shown to be likely cost effective, leading to a

reduction in cost for the rehabilitation episode, as well as reduced costs for health services up to 12 months following discharge (Brusco et al., 2014, 2015). Another additional benefit that may be afforded from weekend therapy is improved hospital flow, as studies have demonstrated that Saturday allied health services result in increased weekend admission rates to rehabilitation (DiSotto-Monastero et al., 2012; Hakkennes et al., 2015). This may enable more patients to be admitted to rehabilitation over time (DiSotto-Monastero et al., 2012), or reduce delays in patient transfer, leading to savings in time and cost (Victorian Auditor-General's Office, 2008). Participants in the prospective cohort receiving 6-day physiotherapy showed no difference in LOS compared to those in 2011 receiving 5-day physiotherapy. This is despite the lower functional level of patients allocated to receive 6-day physiotherapy, which is in contrast to a finding that patients with reduced functional independence tend to have longer LOS (Hayward, Kuys, Barker, & Brauer, 2014; Heinemann, Linacre, Wright, Hamilton, & Granger, 1994; Reistetter et al., 2010).

Participants who received the 6-day physiotherapy service in the prospective cohort were generally more impaired than those in 2011 receiving 5-day physiotherapy. Perhaps unsurprisingly, these participants also demonstrated significantly greater improvements in gait and balance measures. This is likely due to patients that are more disabled having more potential to improve, however these improvements remained, even when the lower level of functional independence on admission was accounted for. Another possibility is that the extra session of physiotherapy per week may have improved carry-over of skills and increased activity levels on the ward.

Studies of stroke (English, Bernhardt, & Hillier, 2014) and elderly orthopaedic (Peiris et al., 2012a) rehabilitation inpatient populations support this premise showing increased weekend activity levels following weekend physiotherapy intervention. Increased activity levels in rehabilitation have also been associated with improved functional independence and a trend for reduced LOS (Peiris, Taylor, & Shields, 2013).

The 6-day physiotherapy service described in this study was pragmatically delivered. It was developed following a review of the literature, survey of a sample of weekend therapy practices in rehabilitation facilities (Chapter 3) and staff surveys (Chapter 6), to determine what type of service was most effective, and would be most feasible in the current rehabilitation unit setting. This model was then implemented within the budgetary constraints of the department. As such, a half-day 6-day physiotherapy service staffed by one acute physiotherapist and an assistant-in-nursing staff member was introduced to the rehabilitation unit. This contrasts with other studies investigating weekend service provision in rehabilitation, which utilised full-day services of either physiotherapy (Brusco et al., 2007), or multidisciplinary therapy (Brusco et al., 2007; DiSotto-Monastero et al., 2012; Hakkennes et al,. 2015; Peiris, Shields, et al., 2013; Ruff et al., 1999). The 6-day service in this study used specific criteria to determine which participants would receive the service. This is again different to the methods used in previous studies investigating weekend rehabilitation service provision (Brusco et al., 2007; DiSotto-Monastero et al., 2012; Peiris, Shields, et al., 2013; Ruff et al., 1999) where all participants in the intervention group received extra therapy. The use of eligibility criteria demonstrates the real world approach of

the service implementation, as patients of different acuity and diagnostic criteria respond differently to extra physiotherapy intervention (Hakkennes et al., 2015). Further research is required to examine the response of different diagnostic populations to the provision of weekend rehabilitation therapy, and into other methods of service delivery, such as multidisciplinary therapy services, to determine what is required to achieve a clinically significant or cost-effective change for patients and hospitals. As the weekend service implemented in this study was delivered by a physiotherapist working on the acute wards, it is also important to investigate the impact of staffing expertise and currency of practice on service delivery. Care provided in Acute Stroke Units by therapists and nurses with an interest and specialised skills in stroke resulted in reduced mortality and disability compared to generalised ward care (National Stroke Foundation, 2010), therefore it is reasonable that this may apply to the rehabilitation setting as well.

4.5.1 Limitations

There are several limitations in this trial. Firstly, the study does not utilise an RCT design. RCT methodology is the optimal method to test the efficacy and effectiveness of an intervention, however it was not feasible to incorporate this design in a study taking place at one location. In addition, there were also no independent assessors to determine eligibility of participants allocated to the 6-day service in order to reduce bias, nor are participants or therapists blinded to the allocation of participants to receive 6-day therapy, therefore this is a limitation of this effectiveness study. As the prospective intervention and historical cohorts were similar demographically,

functionally and physically on admission, this is unlikely to have influenced the results of the study. Secondly, the two study periods occurred at different times of the year, and therefore seasonal variation in admissions could not be controlled for and may have influenced findings (Schmidt, Taeger, Buecker-Nott, & Berger, 2003). Again, as there was no variation between the cohorts on admission, it is unlikely that this has confounded the results. Thirdly, this study only investigated the impact of extra physiotherapy services on LOS, functional independence and gait and balance measures. Within the rehabilitation setting, there are many variables that impact on these measures. The impact of other therapy disciplines on discharge planning and rehabilitation outcomes was not investigated in this study, however there was no variation in the delivery of other multi-disciplinary services, so this is unlikely to account for any between group differences. Fourthly, this study took place at only one site, accounting for only one facility's service delivery model, casemix, staffing expertise and approaches, which may limit the generalisability of these results to other rehabilitation units. Fifth, the physiotherapy staff rostered to deliver the 6-day service were part of the acute weekend service and were not routinely working in the rehabilitation unit. It is possible that this may have impacted on the number of participants able to be allocated to the 6-day service, and the quality or efficiency of therapy provided. Staff with a special interest and ongoing education programs involved in Acute Stroke Units are a key feature for the delivery of specialised care within these units (Stroke Unit Trialists' Collaboration, 2013). It is reasonable to assume that this may also be the case in rehabilitation units. There was no change to usual care in rehabilitation between the two periods, apart from the introduction of the 6-day service. Therapy staff are rotational, however training methods used to

orient staff to rehabilitation remained constant, therefore the staffing profile is unlikely to influence the outcomes of this study. Lastly, this study did not investigate the costs involved in delivering the 6-day physiotherapy service in rehabilitation. While it is possible to suggest that a reduction in LOS would lead to cost savings for the hospital, this has not been investigated in this study.

4.6 Conclusion

Provision of a 6-day rehabilitation physiotherapy service in a real world setting has demonstrated a small, though non-significant, reduction in LOS with some improvements in gait and balance measures on discharge. Regardless, these small improvements could have cost-saving effects for hospitals and improve the flow through of patients, which would require further investigation. However, this may not be the most effective method of weekend service delivery. Further research needs to be undertaken investigating staff expertise, the effect on different diagnostic groups and multidisciplinary approaches of weekend service delivery on rehabilitation LOS and patient outcomes.

Chapter 5 – Study 2 – The impact of staffing model in a 6-day rehabilitation physiotherapy service

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Implementation of a 6-day physiotherapy service in an inpatient rehabilitation unit, staffed with physiotherapists usually working on the acute wards, resulted in a non-significant reduction in LOS, along with some improvements in gait and balance. However, this study highlighted areas for further investigation. These included the impact of staffing expertise and currency of practice when delivering weekend rehabilitation services and if diagnostic populations respond differently to weekend physiotherapy service provision. The following study focuses on answering these questions, comparing staffing models, specifically investigating the impact of currency of practice in providing a weekend rehabilitation service, as well as exploring the impact of weekend physiotherapy service delivery on different diagnostic groups.

* Minor adaptations to the paper have been made to be included in this thesis. For full paper, see Appendix 3b.

5.1 Abstract

Aim: This study aims to determine whether staffing a rehabilitation weekend physiotherapy service with physiotherapists currently working in rehabilitation leads to improved patient outcomes (LOS, functional independence, gait and balance) compared to a service staffed with physiotherapists working in acute wards. A secondary aim was to determine if these outcomes differed between diagnostic groups.

Methods: A prospective cohort study with historical control was completed. All participants admitted to rehabilitation over two, twenty-week periods were included. Weekend physiotherapy was provided by physiotherapists working in rehabilitation in the prospective cohort (2012), and physiotherapists working in acute wards in the historical control (2011). Outcomes included LOS, FIM, and gait and balance measures.

Results: There were 504 participants; 234 in the prospective cohort and 270 in the historical control. No difference was found in LOS between staffing models (mean difference -1.5 days, 95%CI -4.4 to 1.3). Greater FIM change (mean difference 3.5, 95%CI 0.3 to 6.7) and efficiency (FIM change/LOS: mean difference 0.3, 95%CI 0.1 to 0.5) were found with rehabilitation compared to acute staffing. No difference in LOS was found between diagnostic groups with different staffing models. Orthopaedic populations had a significantly greater FIM change (mean difference 3.8, 95%CI 0.4 to 7.1), while FIM efficiency was improved in neurological (mean difference 0.4, 95%CI 0.1 to 0.7) and orthopaedic populations (mean difference 0.3, 95%CI 0.03 to 0.5) with rehabilitation staffing.

Conclusion: Staffing a weekend rehabilitation service with physiotherapists currently working in rehabilitation influences functional independence. Diagnostic groups appear to respond differently to weekend therapy.

5.2 Introduction

Rehabilitation weekend physiotherapy leads to greater improvements in functional independence (Peiris, Shields, et al., 2013; Chapter 4), QOL (Peiris, Shields, et al., 2013) and activity levels (Peiris et al., 2012a), with no significant impact on LOS. However, non-significant LOS reductions of up to five days have been demonstrated in general (Brusco et al., 2007; DiSotto-Monastero et al., 2012; Peiris, Shields, et al., 2013; Chapter 4) and stroke rehabilitation (English et al., 2015; English et al., 2016). Such reductions may be clinically relevant and could lead to cost saving for hospitals (Brusco et al., 2014, 2015).

Weekend rehabilitation service delivery models vary in staffing, hours, days and disciplines involved, with no consensus reached on the optimal model (Brusco et al., 2007; Brusco et al., 2014, 2015; DiSotto-Monastero et al., 2012; English et al., 2015; English et al., 2016; Peiris, Shields, et al., 2013; Peiris et al., 2012a; Chapter 4). One aspect of weekend rehabilitation service delivery that has not been previously investigated is staffing experience and currency of practice. Care delivered by staff with specialised skills or interests, and currently working in acute stroke units reduces death and disability post-stroke, compared to conventional units in generalised wards (National Stroke Foundation, 2010; Stroke Unit Trialists' Collaboration, 2013). A similar benefit may occur in specialised rehabilitation units, but it is not clear whether these benefits extend to weekend service delivery (Australasian Faculty of Rehabilitation Medicine, 2011; British Society of Rehabilitation Medicine, 2015; Consultative Committee on Private Rehabilitation, 2016). The approaches of physiotherapy

management required at different stages of a patients' journey are also different. For example, a person with stroke in the intensive care unit would receive very different physiotherapy management (i.e. respiratory management) than that same person in the rehabilitation setting (i.e. functional upper limb and ambulatory retraining). Therefore, it is reasonable that physiotherapists that are not familiar or currently working in the rehabilitation setting may not be as familiar with the processes, or current best-practice management for patients at this stage of their recovery.

Weekend rehabilitation service delivery has often been investigated in mixed rehabilitation cohorts (Brusco et al., 2007; DiSotto-Monastero et al., 2012; Hakkennes et al., 2015; Peiris, Shields, et al., 2013) with the potential for effects to vary across diagnostic groups. For example, improvements in function after weekend rehabilitation have been reported in orthopaedic cohorts (Peiris et al., 2012a), however in stroke populations, weekend physiotherapy has demonstrated no additional benefits beyond usual care for functional outcomes or LOS (English et al., 2015). Differences in rehabilitation outcomes including functional independence and LOS have been described between diagnostic groups, (AROC, 2016a; Granger et al., 2009; Granger et al., 2010a, 2010b; Granger et al., 2011) and it is likely that diagnostic groups may improve at varying rates during inpatient rehabilitation (Kuys et al., 2016; Kuys, Donovan, Mattin, & Low Choy, 2015), suggesting a need to investigate the impact of weekend intervention on these groups individually.

This study aims to determine whether staffing a rehabilitation weekend physiotherapy service with physiotherapists currently working in rehabilitation leads to improved

patient outcomes (LOS, functional independence, gait and balance) compared to a service staffed with physiotherapists working in acute wards. A secondary aim is to determine if these outcomes differed between diagnostic groups.

5.3 Methods

5.3.1 Study design

A prospective cohort study using a historical control was performed in a rehabilitation unit at an Australian metropolitan privately-funded hospital. The unit comprises a mixed rehabilitation cohort including neurological, orthopaedic, and reconditioning conditions and provides a 6-day physiotherapy service. In 2011, the unit was a 40-bed unit, which decreased to a 30-bed unit in 2012. Institutional research ethics committees approved this study (Appendix 1). Consent for participation was not required from each individual participant as the service was deemed usual practice.

5.3.2 Participants

All participants admitted to the rehabilitation unit over a 20-week period from April to August 2012 were included in the prospective cohort. Participants admitted within the same time period in 2011 comprised the historical control. This timeframe was chosen to ensure consistency between this study and Chapter 4. Demographic data were collected for all participants including age, sex and admitting diagnosis.

5.3.3 Procedure

A 4-hour physiotherapy service was delivered on Saturdays, staffed by one physiotherapist and an assistant-in-nursing staff member acting as therapy assistant and porter. The service consisted of two, one-hour group gym sessions, 1.5 hours of one-on-one ward-based treatment sessions, and usual documentation and statistics. This service was the same as that presented in Chapter 4. In the prospective cohort this service was provided by rehabilitation physiotherapists. Rehabilitation physiotherapists were defined as clinicians currently working in the inpatient rehabilitation or day rehabilitation units. In the historical control group, the weekend service was delivered by acute physiotherapists (those working in the acute wards during the collection period). Therapist data including number of years practicing physiotherapy and number of years of rehabilitation experience were collected from physiotherapy staff providing weekend services in both cohorts.

Participants were allocated to the weekend service by their treating physiotherapist in both time periods, and were eligible for the service if they met one or more of the following criteria: were likely to deteriorate over the weekend, making functional improvements and would benefit from weekend physiotherapy input, admitted for a short rehabilitation stay (less than one week), or admitted late in the week (Thursday or Friday). The number of participants able to be seen in the Saturday service was limited by staffing and time constraints. If the number of eligible participants exceeded this limit, consensus was gained between treating therapists to prioritise participants. Participants consistently refusing to participate in weekday physiotherapy sessions were excluded.

5.3.4 Outcome measures

LOS in rehabilitation (number of nights in the rehabilitation unit from admission to discharge) was the primary outcome. Secondary outcomes included functional independence and clinical measures of gait and balance. Functional independence was measured using the FIM which has been validated in a variety of patient populations and therapists (Ottenbacher et al., 1996; Passalent et al., 2011). FIM change (difference between admission and discharge FIM scores) and FIM efficiency (FIM change divided by LOS) were also collected. Gait speed and step length were measured using the 10MWT which has excellent test-retest (Bohannon, 1997) and interrater reliability with older populations and is positively correlated with mobility improvements in elderly populations (Wolf et al., 1999). Balance measures included the TUG (Podsiadlo & Richardson, 1991; Steffen et al., 2002), FR (Duncan et al., 1990; Isles et al., 2004), Step Test (average) (Hill et al., 1996; Hong et al., 2012) FTEC (Shumway-Cook & Horak, 1986), and the BOOMER (Haines et al., 2007); all with demonstrated validity and reliability for use with older adults as outlined in Chapter 4. Information regarding utilisation of the Saturday service, including number of participants receiving the Saturday service, average number of Saturday sessions attended, and length of Saturday physiotherapy treatment was also collected.

5.3.5 Data analysis

Data were examined for normality using the Shapiro-Wilk test, and transformations performed for variables that were not normally distributed. Differences in characteristics, LOS and FIM efficiency between staffing models were determined

using independent t-tests for continuous data and Mann-Whitney U-tests for interval data. Effects of group, time or group x time interactions were determined using repeated-measures analysis of variances for functional independence, gait and balance measures. Participants were grouped according to admitting diagnosis; neurological (stroke and other neurological diagnosis), orthopaedic (elective and traumatic orthopaedic, chronic pain and musculoskeletal diagnoses) and reconditioning (participants requiring reconditioning following surgery or illness) groups. Eleven participants (all with amputee diagnoses) were excluded from this diagnostic analysis as their diagnoses did not fit these categories. Differences in diagnostic categories were determined using one-way analysis of variances with post hoc testing (Tamhane's T2 test). To determine differences in LOS or FIM efficiency between staffing models, independent t-tests were performed for each diagnostic group separately. A repeated measures analysis of variance model was performed for each diagnostic group separately to determine the impact of staffing model, time, or group x time interactions for functional independence, gait and balance measures. Statistical analysis was completed using SPSS (version 23, Chicago, IL), using $p < 0.05$ to indicate statistical significance.

5.4 Results

5.4.1 Participants

There were 504 participants in this study; 234 in the prospective cohort (rehabilitation staffing), and 270 in the historical control (acute staffing). Participants in both groups were similar in age, sex and diagnostic spread ($p > 0.324$) (Table 5-1). A greater

proportion of participants received weekend physiotherapy when staffed by rehabilitation (73%) compared to acute physiotherapists (60%, p = 0.002). Regardless of staffing, approximately 90% of participants allocated to receive 6-day therapy attended Saturday sessions. Rehabilitation physiotherapists provided more therapy time (p = 0.002) and treated more patients per hour, compared to acute physiotherapists (p = 0.034) (Table 5-1). Physiotherapists providing weekend therapy in the prospective cohort had on average 6.9 (SD 10.7) years physiotherapy experience, compared to 3.9 (SD 9.9) years in the historical control, and 3.28 (SD 5.1)

Table 5-1: Characteristics of all participants in the rehabilitation unit during the prospective cohort and historical control periods.

Variable	Historical control n=270	Prospective cohort n=234	p-value
Age, years, mean (SD)	77 (12.4)	79 (10.7)	0.324
Female, n (%)	159 (59%)	141 (60%)	0.755
Admitting diagnosis, n (%)			0.793
Stroke	25 (9.3%)	22 (9.4%)	
Neurological	42 (15.6%)	38 (16.2%)	
Amputee	4 (1.5%)	7 (3%)	
Musculoskeletal	15 (5.6%)	12 (5.1%)	
Orthopaedic trauma	60 (22.2%)	45 (19.2%)	
Orthopaedic elective	54 (20%)	54 (23.1%)	
Reconditioning	70 (25.9%)	56 (23.9%)	
LOS, days, mean (SD)	17.7 (12.9)	17.3 (10.8)	0.059
Admission FIM (score/126), mean (SD)	96.4 (19.9)	89.7 (17.8)	0.071
Number of participants allocated to weekend service, n (%)	162 (60%)	171 (73%)	0.002
Number of weekend sessions attended per participant across their LOS, mean (SD)	1.7 (1.1)	1.7 (1.3)	0.147
Participants seen per hour during weekend session, mean (SD)	3.1 (0.3)	3.3 (0.3)	0.034
Time spent in weekend therapy (mins), mean (SD)	75.9 (43.8)	89.8 (60.6)	0.002

FIM = Functional Independence Measure, LOS = Length of stay, mins = minutes, n = number, SD = standard deviation

years rehabilitation experience compared to 1.28 (SD 3.1) years in the historical control, with no significant differences between groups ($p > 0.306$).

5.4.2 Comparison of outcomes between acute versus rehabilitation staffing of Saturday physiotherapy service

Outcomes for the prospective and historical cohorts are presented in Table 5-2. There was no difference in LOS between the two groups. Results revealed no effect of group ($p = 0.76$) but an effect of time ($p < 0.001$) and a group x time interaction ($p = 0.032$) for FIM scores. Compared to acute staffing, participants receiving Saturday rehabilitation staffing showed a significantly greater improvement in FIM scores (mean difference 3.5, $p = 0.032$) and FIM efficiency (mean difference 0.3, $p = 0.009$). All measures of gait and balance showed an effect of time ($p < 0.024$) but no group or group x time interaction ($p > 0.105$).

5.4.3 Comparison of outcomes by diagnostic group in the prospective and historical cohorts

Table 5-3 presents demographic information for diagnostic groups. The most common diagnostic group was orthopaedic, at both time-periods. In the acute staffing time-period, participants with reconditioning diagnoses were older than other diagnostic groups ($p < 0.015$). There was no difference in age between groups for the rehabilitation staffing time-period, but there were consistently fewer females with

Table 5-2: Mean (SD) outcome measures for all participants for historical control and prospective cohort at admission and discharge, mean (SD) within group differences (discharge minus admission) and mean (95% confidence interval (CI)) differences between intervention and control periods.

Outcomes	Historical control (acute staffing) Mean (SD)		Prospective cohort (rehabilitation staffing) Mean (SD)		Historical control DC-ADM Mean (SD)	Prospective cohort DC- ADM Mean (SD)	Prospective – historical groups Mean difference (95% CI)
	ADM	DC	ADM	DC			
LOS, days	-	20.5 (14.60)	-	19.0 (11.25)	-	-	-1.5 (-4.4 to 1.3)
FIM (score/126)	91.2 (20.28)	106.0 (18.90)	88.9 (17.18)	107.1 (17.16)	14.8 (16.62)	18.3 (12.49)	3.5 (0.3 to 6.7)
FIM efficiency	-	0.8 (1.31)	-	1.1 (0.76)	-	-	0.3 (0.1 to 0.5)
TUG (s)	33.2 (19.09)	21.7 (11.05)	34.4 (18.25)	21.1 (10.22)	-12.1 (14.66)	-14.1 (15.13)	-2.0 (-6.3 to 2.3)
10MWT (m/s)	0.4 (0.31)	0.6 (0.32)	0.4 (0.33)	0.7 (0.34)	0.3 (0.27)	0.3 (0.28)	0.0 (-0.1 to 0.1)
FR (cm)	10.7 (10.20)	17.7 (10.00)	9.1 (10.35)	18.7 (10.13)	7.2 (8.42)	9.0 (9.02)	1.7 (-0.4 to 3.8)
Step Test (n)	2.4 (3.70)	5.0 (4.55)	2.0 (3.63)	5.5 (5.07)	2.8 (3.41)	3.4 (4.19)	0.6 (-0.3 to 1.5)
FTEC (s)	15.8 (13.64)	24.6 (10.82)	13.3 (14.19)	23.4 (11.34)	9.0 (12.55)	9.6 (12.93)	0.6 (-2.4 to 3.6)
BOOMER (score/16)	5 (4.35)	9 (4.32)	5 (4.58)	9 (4.23)	4 (3.40)	4 (3.63)	0 (-0.5 to 1.2)

ADM = admission, BOOMER = Balance Outcome Measure of Elder Rehabilitation, cm = centimetres, DC = discharge, FIM = Functional Independence Measure, FR = Functional Reach, FTEC = Feet Together Eyes Closed, LOS = Length of stay, m/s = meters per second, TUG = Timed Up and Go Test, 10MWT = 10 Meter Walk Test.

Table 5-3: Demographic information of participants in historical control and prospective cohorts by diagnostic groups.

	Historical control (acute staffing) (n=266)*			Prospective cohort (rehabilitation staffing) (n=227)*		
	N	O	R	N	O	R
Number of participants	67	129	70	60	111	56
Age, years, mean (SD)	73 (14.24)	78 (12.71)	82 (7.45)	76(11.96)	80 (10.35)	80 (9.64)
Female, n (%)	26 (38.8)	91 (70.5)	41 (58.6)	29 (48.3)	76 (68.5)	35 (62.5)
LOS, days, mean (SD)	20.7 (15.99)	16.5 (9.8)	16.6 (13.99)	18.7 (13.32)	16.6 (9.98)	15.4 (7.17)
Admission FIM (score/126), mean (SD)	89.9 (26.52)	97.7 (15.96)	100.6 (17.91)	87.7 (17.20)	88.9 (18.88)	93.5 (16.49)
Number of participants allocated to weekend service, n (%)	39 (58.2%)	84 (65.1%)	37 (52.9%)	44 (73.3%)	86 (77.5%)	34 (60.7%)
Number of weekend sessions attended per participant, mean (SD)	1.2 (1.61)	1.0 (0.90)	0.9 (1.14)	1.8 (1.36)	1.7 (1.32)	1.7 (1.32)
Time spent in weekend therapy (mins), mean (SD)	77.1 (53.39)	76.6 (38.49)	66.1 (41.86)	71.0 (46.17)	99.5 (69.13)	83.3 (38.74)

* A total of 11 patients across both groups had a diagnosis of amputee and were not included in diagnostic analysis

FIM = Functional Independence Measure, LOS = length of stay, mins = minutes, N = patients with a neurological diagnosis, n = number, O = patients with an orthopaedic diagnosis, R = patients with a reconditioning diagnosis, SD = standard deviation.

Table-5-4: Mean (SD) outcome measures for all participants for historical and prospective periods, by diagnostic groups at admission and discharge, mean (SD) within group differences (discharge minus admission) and mean (95% confidence interval (CI)) differences between intervention and control periods.

Outcomes	Historical control (acute staffing) Mean (SD)						Prospective cohort (rehabilitation staffing) Mean (SD)						Historical control DC-ADM Mean (SD)			Prospective cohort DC- ADM Mean (SD)			Prospective – historical groups Mean difference (95% CI)		
	ADM			DC			ADM			DC											
	N	O	R	N	O	R	N	O	R	N	O	R	N	O	R	N	O	R	N	O	R
LOS, days	-	-	-	24.6 (19.05)	18.7 (10.38)	20.9 (17.02)	-	-	-	20.6 (13.56)	18.1 (10.48)	16.5 (6.55)	-	-	-	-	-	-	-4.0 (-11.2 to 3.2)	-0.6 (-3.8 to 2.6)	-4.4 (-10.6 to 1.9)
FIM (score/126)	80.9 (26.19)	94.5 (16.15)	93.4 (19.12)	99.0 (19.88)	109.5 (14.14)	104.6 (24.87)	84.0 (16.76)	89.4 (17.64)	93.6 (16.22)	102.7 (19.22)	108.1 (16.73)	109.7 (16.22)	18.1 (16.13)	14.9 (9.44)	11.2 (26.73)	18.7 (16.08)	18.7 (12.14)	16.1 (8.65)	0.6 (-6.6 to 7.9)	3.8 (0.4 to 7.1)	4.9 (-4.7 to 14.9)
FIM efficiency	-	-	-	0.7 (0.46)	0.9 (0.65)	0.6 (2.5)	-	-	-	1.1 (0.83)	1.2 (0.81)	1.1 (0.58)	-	-	-	-	-	-	0.4 (0.1 to 0.7)	0.3 (0.03 to 0.5)	0.5 (-0.4 to 1.4)
TUG (s)	26.3 (15.01)	35.5 (20.00)	33.4 (19.58)	21.1 (11.86)	22.2 (10.16)	21.0 (12.50)	27.1 (13.77)	42.1 (20.81)	28.6 (10.90)	20.7 (13.59)	22.6 (9.47)	17.9 (5.65)	-8.5 (9.57)	-13.3 (17.36)	-12.2 (10.60)	-8.8 (11.27)	-19.8 (18.35)	-10.8 (8.58)	-0.3 (-6.7 to 6.1)	-6.6 (-13.9 to 0.7)	1.4 (-4.3 to 7.2)
10MWT (m/s)	0.4 (0.36)	0.4 (0.29)	0.4 (0.33)	0.7 (0.38)	0.6 (0.26)	0.7 (0.36)	0.4 (0.38)	0.3 (0.30)	0.5 (0.28)	0.7 (0.42)	0.6 (0.29)	0.7 (0.24)	0.3 (0.35)	0.2 (0.23)	0.3 (0.27)	0.3 (0.33)	0.3 (0.27)	0.2 (0.24)	0 (-0.2 to 0.1)	0.1 (-0.01 to 0.2)	-0.02 (-0.05 to 0.1)
FR (cm)	9.4 (11.29)	11.1 (9.86)	11.7 (9.82)	15.7 (10.87)	18.1 (8.98)	20.0 (10.30)	10.4 (10.56)	7.6 (10.34)	13.3 (9.41)	19.2 (10.82)	18.7 (10.12)	20.6 (7.08)	7.2 (8.57)	6.9 (7.92)	8.4 (9.51)	8.4 (6.65)	10.8 (10.57)	6.7 (7.11)	1.2 (-2.5 to 4.8)	3.9 (0.7 to 7.0)	-1.7 (-6.2 to 2.7)
Step Test (n)	3.3 (4.19)	2.0 (3.32)	2.5 (3.97)	5.9 (4.59)	4.3 (4.36)	5.9 (4.71)	3.2 (4.73)	1.0 (2.72)	3.1 (3.44)	6.4 (5.77)	5.0 (4.97)	6.3 (4.10)	2.8 (3.82)	2.5 (3.16)	3.4 (3.55)	3.4 (4.24)	3.7 (4.54)	3.0 (3.34)	0.6 (-1.3 to 2.6)	1.2 (-0.1 to 2.5)	-0.4 (-2.2 to 1.4)
FTEC (s)	15.4 (13.56)	16.4 (14.07)	16.0 (12.98)	24.0 (11.27)	25.6 (9.85)	24.5 (11.18)	14.1 (14.44)	11.2 (13.92)	20.9 (12.59)	21.3 (12.36)	24.6 (10.35)	26.6 (8.90)	9.2 (12.37)	9.4 (12.56)	8.5 (13.26)	7.3 (11.09)	13.4 (14.58)	5.1 (8.82)	-1.9 (-7.4 to 3.7)	4.0 (-0.6 to 8.6)	-3.4 (-9.4 to 2.6)
BOOMER (score/16)	5 (4.84)	5 (4.21)	5 (4.16)	9 (4.61)	9 (3.93)	9 (4.46)	5 (5.06)	4 (4.08)	7 (4.23)	9 (4.49)	9 (4.01)	10 (3.13)	4 (3.90)	4 (2.93)	4 (3.86)	4 (3.19)	5 (3.95)	3 (2.84)	0 (-1.7 to 1.7)	1.0 (0.04 to 2.4)	-1.0 (-2.8 to 0.8)

ADM = admission, BOOMER = Balance Outcome Measure for Elder Rehabilitation, cm = centimetres, DC = discharge, FIM = Functional Independence Measure, FR = Functional Reach, FTEC = Feet Together Eyes Closed, LOS = length of stay, m/s = meters per second, N = patients with a neurological diagnosis, n = number, O = patients with an orthopaedic diagnosis, R = patients with a reconditioning diagnosis, s = seconds, SD = standard deviation, TUG = Timed Up and Go Test.

neurological diagnoses than other diagnoses ($p < 0.030$). There was no difference across groups in LOS or admission FIM. A greater number of participants with an orthopaedic diagnosis were allocated to the 6-day service compared to other diagnoses ($p < 0.050$) regardless of staffing expertise. Participants with an orthopaedic diagnosis also spent more time in weekend physiotherapy sessions with rehabilitation physiotherapists compared to acute physiotherapists ($p = 0.014$).

Table 5-4 presents outcomes of participants receiving 6-day physiotherapy in the historical and prospective cohorts by diagnosis. There was no significant change in LOS when examined by diagnosis, however participants with a neurological or reconditioning diagnosis had an average LOS reduction of approximately four days with rehabilitation weekend staffing compared to acute. Only participants with an orthopaedic diagnosis had a significantly greater change in FIM score with rehabilitation compared to acute staffing (mean difference 3.8, $p = 0.027$). FIM efficiency significantly improved with rehabilitation compared to acute staffing for participants with neurological and orthopaedic, but not reconditioning diagnoses. Participants with orthopaedic diagnoses demonstrated greater improvements in FR and BOOMER scores with rehabilitation staffing. There were no other differences in measures between rehabilitation and acute staffing models for diagnostic groups.

5.5 Discussion

The effect of staffing model in a rehabilitation weekend physiotherapy service was investigated. The findings suggest that a weekend rehabilitation service provided by staff currently working in rehabilitation has service and patient benefits. There was a greater improvement in FIM measures with current rehabilitation staff compared to acute staff. More participants attended, and more time was spent in weekend therapy when it was provided by rehabilitation staff. The benefits gained appeared to vary by diagnostic group. There were mixed findings on the impact on functional independence, as participants with an orthopaedic diagnosis demonstrated greater functional improvements, while those with a neurological or orthopaedic diagnosis had better FIM efficiency with rehabilitation physiotherapists.

While not significant, a 1.5 day reduction in LOS was found with participants receiving weekend therapy provided by rehabilitation physiotherapists compared to acute staff. This is comparable to other studies, with non-significant LOS reductions of between one and three days demonstrated (Brusco et al., 2007; DiSotto-Monastero et al., 2012; English et al., 2015; Peiris, Shields, et al., 2013; Chapter 4). Additionally, a recent meta-analysis investigating the effect of weekend service provision in stroke populations found a non-significant reduction in LOS by 5.7 days (English et al., 2016). While it is acknowledged that many factors such as social situation, discharge destination and community services contribute to LOS, these findings may have clinical relevance. As patient LOS is the largest contributor to inpatient rehabilitation costs (Brusco et al., 2014), it is feasible that even small LOS reductions may result in cost

savings for health services. Therefore, further exploration is warranted to determine which population or service delivery models may successfully result in a reduction in costs. A 6-day rehabilitation service has been found to be likely cost effective at 30 days (Brusco et al., 2014) and 12 months post-rehabilitation discharge (Brusco et al., 2015). Small reductions in LOS, for example up to three days, can result in a cost saving to the health service of approximately $AUD 600,000 per year in an average 30 bed rehabilitation unit in Australia (Brusco et al., 2007). To determine the actual cost saving effect of the weekend service model proposed in the current study, further economic analysis is required.

The main differentiating factor between the two models of weekend rehabilitation service investigated in this study appears to relate to currency of practice. Interestingly, there was no significant difference between staffing groups providing the weekend service in years of physiotherapy or rehabilitation experience, contrary to expectations. Despite this, the physiotherapists providing 6-day therapy in the prospective cohort had approximately double the amount of experience working both as a physiotherapist, and in rehabilitation, compared to those staffing the 6-day service in the control group. It may be that staff working in rehabilitation were more familiar with rehabilitation processes and expectations, as well as having knowledge of the rehabilitation patients; and were therefore able to manage more participants in group sessions, and more efficiently and effectively challenge patients and progress patient management over the weekend. This may have contributed to the increased efficiency of functional outcomes seen with current rehabilitation staffing compared to acute staffing of the weekend service. An increased efficiency and improved service

provision has been found for staff working within acute stroke units, (Langhorne & Pollock, 2002; National Stroke Foundation, 2010) and the results of this study indicate that this may also be likely in the rehabilitation setting.

Participants spent on average 15 minutes extra in rehabilitation on a weekend when current rehabilitation staff provided the weekend service. This amount of active therapy time seems unlikely to be sufficient to alone account for the significant improvement in function. While an increased therapy time of 19 minutes per day results in improved rehabilitation patient outcomes (Peiris et al., 2011; Veerbeek, Koolstra, Ket, van Wegen, & Kwakkel, 2011), increased scheduled therapy time is a significant predictor of patient improvement in stroke populations (Lohse, Lang, & Boyd, 2014). It may be that even a small increase in the structured therapy time may result in higher levels of physical activity overall. In support, in orthopaedic rehabilitation populations, people receiving weekend therapy input were more active and spent more time upright on the day of therapy, and in the days following (Peiris et al., 2012a). The factors underpinning this increased activity have not yet been investigated but may include increased motivation or self-efficacy for exercise (Magnan, Kwan, & Bryan, 2013), the avoidance of regression of functional gains with rest days, increased tolerance for activity, and a positive effect on mood (WHO, 2015).

Diagnostic groups responded differently to weekend physiotherapy provided by the two staffing models. A comparatively greater reduction in LOS by four days for neurological and reconditioning, compared to orthopaedic participants treated by rehabilitation staff, was unexpected. Although this finding was not significant due to

large variation between participants, it remains important as people admitted for rehabilitation with these diagnoses have been shown to have a longer LOS than people with an orthopaedic diagnosis (AROC, 2016a; Granger et al., 2009; Granger et al., 2010a, 2010b; Granger et al., 2011). The reduction in LOS observed in the current study for neurological participants could lead to significant cost savings, as people with neurological conditions place a significant burden on hospitals and the health care system; up to AUD$880 million annually in Australia (Deloitte Access Economics, 2013, 2015).

Discharge FIM scores appeared to be similar regardless of staffing model or diagnosis, which supports previous suggestions that a minimum functional capacity is required for discharge to the community (Kuys et al., 2016). FIM change and FIM efficiency may therefore be better indicators of patients likely to benefit the most from weekend rehabilitation services. Participants with orthopaedic diagnoses, for example, demonstrated greater functional improvements, greater FIM efficiency and greater balance improvements when managed by rehabilitation therapists compared to the other diagnostic groups. In this rehabilitation unit, orthopaedic diagnoses formed the majority of participants receiving weekend therapy and spent longer in Saturday therapy with rehabilitation staffing of the 6-day service. The increased potential for improvement for patients in the post-operative period (Bindawas et al., 2014), combined with an increased intensity of therapy may account for the larger functional improvements seen in the orthopaedic population when managed by rehabilitation staff. Further research regarding diagnostic group response to 6-day service provision is required to determine what factors contribute to these increases in functional gains.

5.5.1 Limitations

This study had several limitations. This study was not an RCT. Whilst RCT methodology is optimal to assess the efficacy of an intervention, this study aimed to compare the effectiveness of two staffing models. A high risk of contamination precluded a design of concurrent parallel groups randomised to receive weekend therapy by different staff in the one site. RCT methodology would provide a higher level of evidence, but this pragmatic trial found similar results to past RCTs (Brusco et al., 2007; Peiris, Shields, et al., 2013). However, there have been no RCTs investigating different staffing expertise on the delivery of weekend rehabilitation services. It would be useful for this to occur, in order to confirm the efficacy of the results found in this study, given that the effectiveness has now been investigated. Conducting this study at one site accounts for only this facility's casemix, service delivery models, staffing approaches and expertise, which may limit the generalisability to other rehabilitation units. This study was not powered to examine the differences in diagnostic groups, therefore these results need to be interpreted with caution. This study only investigated the impact of a single discipline (physiotherapy) in rehabilitation care on LOS, functional independence and gait and balance measures. The impact of other disciplines on rehabilitation outcomes and discharge planning were not investigated in this study, however there was no variation in the delivery of other disciplines therapy, therefore this is unlikely to impact or account for any between group differences. When examining the fidelity of the 6-day service, one week of data was missing in the prospective cohort regarding the attendance of allocated participants to the Saturday therapy session. However, as the number of participants in both groups attending the

service was approximately 90% of those allocated, it seems unlikely that this missing data would have altered this result significantly.

5.6 Conclusion

In summary, staffing a weekend rehabilitation physiotherapy service with physiotherapists currently working in rehabilitation leads to improvements in FIM scores and efficiency, service delivery efficiencies, and demonstrated a trend toward a reduction in LOS, compared to a model staffed by acute physiotherapists. Neurological and reconditioning populations receiving weekend physiotherapy demonstrated a non-significant but possibly clinically significant reduction in LOS with rehabilitation staffing. Participants with orthopaedic diagnoses received more therapy sessions and showed greater functional improvements. Future research could further investigate the efficacy of weekend rehabilitation services on different diagnostic groups.

Chapter 6 – Study 3 – Implementing a 6-day physiotherapy service in rehabilitation – exploring staff perceptions

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A formative evaluation was completed alongside the previous two studies (Chapters 4 and 5) to determine staffing perspectives and acceptability of the implementation of a weekend rehabilitation service. Formative evaluations are used to collect ongoing feedback in the translation of evidence into clinical practice. In this study, a formative evaluation was used to gain insight into the barriers and facilitators to providing a weekend service, as well as to review the strengths and weaknesses of the service.

*Minor adaptations to the paper have been made to be included in this thesis. For full paper, see Appendix 3c.

6.1 Abstract

Aim: This study aimed to investigate staff perceptions on service provision, barriers and facilitators, and the perceived impact of a 6-day service on LOS and goal attainment with the implementation of various forms of 6-day service delivery.

Methods: Multidisciplinary rehabilitation staff were surveyed regarding adoption, acceptability (barriers, facilitators and perceptions), appropriateness, and feasibility of the impact of a 6-day physiotherapy service on LOS and patient goal attainment, at three time points: pre- and post-implementation, and post-modification of the staffing model of the 6-day physiotherapy service.

Results: Fifty-one staff (50%) responded. Pre-implementation, all staff identified barriers to 6-day service implementation, the most common being staffing (62%) and patient selection (29%). Post-implementation, only 30% staff identified issues, which differed to those identified pre-implementation. Over time, staff acceptability changed from being unsure to being positive about the effect of the 6-day service on LOS and patient goal attainment.

Conclusion: Staff perceived a large number of barriers prior to implementation of a 6-day rehabilitation service, however these did not eventuate following implementation. Staff perceived improved LOS and patient goal attainment after implementing a 6-day rehabilitation service incorporating staff feedback.

6.2 Introduction

Translating evidence into clinical practice involves many stakeholders (McCluskey, Vratsistas-Curto, & Schurr, 2013). In a rehabilitation unit, these include patients, family/carers, medical, nursing and allied health staff, and organisational staff. The perceptions and involvement of these stakeholders when implementing and changing a service are key to the success and effectiveness of the service (Shee et al., 2014). Frontline employees are a valuable resource in planning, implementation and modification of a service (Melton & Hartline, 2010). Within hospitals, medical, nursing and allied health staff are uniquely located to observe patient and family member reactions to a service and can provide the organisation with feedback (Melton & Hartline, 2010; Yang et al., 2016). Support for a new service is dependent on the user's acceptability of the forthcoming benefits, and how it can be translated into their context (Donaldson & Finch, 2012). Staff participation in planning and evaluating a new service positively impacts staff attitudes, service quality (Melton & Hartline, 2010) and commitment to the service, all necessary for successful change (Kotter & Schlesinger, 2008). Seeking feedback regularly allows for ongoing service modification to maximise patient outcomes and smooth operation (Donaldson & Finch, 2012).

Collecting ongoing feedback is necessary to study the translation of evidence into clinical practice. A formative evaluation has been utilised in this study to aid in determining appropriateness, feasibility and acceptability of weekend service provision in rehabilitation (CDC, 2007). In this study, feedback was sought during the implementation of a 6-day

physiotherapy rehabilitation service, which represented a change in delivery volume and pattern from the usual 5-day service. Several RCTs have found 6-day allied health rehabilitation services improve patient QOL, independence, and activity, with potential reductions in LOS (Brusco et al., 2007; Peiris, Shields, et al., 2013; Peiris et al., 2012a). Implementing a similar service in a real world setting requires an understanding of the service (Moore et al., 2014) and staff engagement to increase acceptability and adoption, and enact change. Staff feedback is imperative to ensure smooth implementation when translating trial results into clinical practice. Feedback provided by staff through formative evaluations can ensure the proposed program will be accepted and understood by staff, and allows for modifications to be made before implementation (CDC, 2007). This feedback should be sought prior to implementation of a service to determine feasibility and appropriateness, and optimise service design; and after implementation to evaluate effectiveness (Moore et al., 2015).

To date, no studies have investigated staff perspectives when implementing a weekend rehabilitation service. This study aims to investigate staff perceptions on service provision, barriers and facilitators, and the perceived impact of a 6-day service on LOS and goal attainment with the implementation of various forms of 6-day service delivery.

6.3 Methods

A cross-sectional formative evaluation was conducted to explore staff perceptions of the implementation of a 6-day rehabilitation physiotherapy service.

6.3.1 Participants

Medical, allied health and nursing staff members of a rehabilitation unit in a private metropolitan hospital in Australia were surveyed. To be included in the study, staff were required to have worked in rehabilitation during the trial (March-August 2011 or March-August 2012), or be involved in working the 6-day rehabilitation physiotherapy service.

6.3.2 Procedures

Participants were surveyed at three time points. The pre-implementation survey was conducted prior to, and informed, the development and implementation of a 6-day physiotherapy rehabilitation service (Chapter 4). A second survey (post-implementation) occurred six months after service implementation. In accordance with feedback received in these two surveys, the Saturday service was adjusted to be staffed by physiotherapists working in rehabilitation, rather than physiotherapists working on the acute wards (Chapter 5). Staff were surveyed one year following this change, to evaluate the adjusted service (post-modification survey). Consent was implied with the return of the survey for the pre- and post-implementation surveys. Staff completing the post-modification survey provided written informed consent with the returned survey. Copies of the surveys distributed at

each time point can be found in Appendix 2b.1-3. Ethical approval for the study was granted by the University of Queensland Medical Research Ethics Committee and the Uniting Care Health Human Research Ethics Committee (Appendix 1).

The 6-day rehabilitation physiotherapy service was developed following a pre-implementation survey (Chapter 4). As outlined in Chapter 4, the service consisted of four hours of physiotherapy staffed by acute hospital physiotherapists, and an assistant-in-nursing staff member acting as a porter and assistant. The service comprised group rehabilitation gym sessions and individual ward sessions. Eligible patients included those who were making daily improvements, would deteriorate over the weekend, were admitted later in the week (Thursday or Friday) or were admitted for a short rehabilitation stay (less than one week). Patients consistently refusing weekday therapy were not eligible. The rehabilitation unit treated a mixed rehabilitation population and comprised 30-40 beds. The unit was staffed by doctors, nurses, physiotherapists, occupational therapists (3-4 full time equivalent (FTE) each), speech pathologists, dietitians (less than 1 FTE each) and an allied health assistant (1 FTE). Usual care consisted of daily weekday physiotherapy and occupational therapy services, with speech pathology and dietetic services as required. Evaluation of patient outcomes following implementation of the 6-day physiotherapy service are presented in Chapter 4. In summary, with the implementation of a 6-day physiotherapy rehabilitation service there were significant improvements in functional independence and balance, with a trend towards a reduction in LOS of 1.7 days, compared to a 5-day service. Following the post-implementation survey, this physiotherapy service

was modified to be staffed by rehabilitation physiotherapists. Results of this modification are presented in Chapter 5. In summary, rehabilitation physiotherapy staffing of the 6-day service led to improvements in FIM change and efficiency, service delivery efficiencies and a trend towards a reduction in LOS by 1.5 day.

6.3.3 Outcome measures

Three purpose-designed surveys comprising closed and open-ended questions were used to investigate rehabilitation staff perspectives of service provision, including perceived barriers, facilitators, strengths and improvements and perceived impact of the service on LOS and goal attainment (Table 6-1). Hard copies of each survey were provided to participants. Surveys were piloted with physiotherapists at another site prior to distribution and feedback was sought regarding content, clarity, usability and appropriateness of questions. Amendments were made to the surveys to ensure the best responses to the above research questions were facilitated.

6.3.4 Data analysis

Survey responses underwent peer checking and content analysis. Descriptive statistics were undertaken for closed-ended questions reporting frequencies, means and standard deviation as appropriate using SPSS (version 23, Chicago, IL), using $p < 0.05$ to indicate statistical significance. Open-ended questions were summarised, a content analysis completed and compared across time points.

Table 6-1: List of questions asked in each survey.

	Pre-implementation Survey	Post-implementation Survey	Post-modification Survey
Service provision	• How do you think treatment should be provided? (gym, ward, group or individual) • What considerations should be made when allocating patients for a Saturday rehabilitation service? • What do you think is a reasonable number of rehabilitation patients to treat during this four hour period? • What outcome measures should be used to determine the effectiveness of interventions?		
Barriers and facilitators / strengths and improve-ments	• What do you foresee are the barriers for implementing a rehabilitation weekend service at St Andrew's War Memorial Hospital? • How do you think these problems could be managed?	• Did you experience any problems in the implementation of this initiative? • How do you think these problems could have been better managed? • If you participated in running this service, what worked well, and what could be improved? • Was the allocation of patients for Saturday physiotherapy appropriate? If not, how could this be managed better? • How could this service be improved?	• What do you think worked well with this service? • What did you think could be improved? • Do you think the allocation of patients to the Saturday physiotherapy service was appropriate?
Perspectives	• Do you feel that extending the physiotherapy coverage for rehabilitation will decrease a patient's length of hospital stay? Why? • Do you feel that extending the physiotherapy coverage for rehabilitation will help to meet patient goals sooner? Why?	• Do you feel that extending the physiotherapy coverage in rehabilitation aided in decreasing patients' length of hospital stay? Why? • Do you feel that extending the physiotherapy coverage to a Saturday service in rehabilitation helped to meet patient goals sooner? How so?	• Do you think the Saturday physiotherapy service aided in decreasing length of stay for rehabilitation patients? Why? • Do you think the Saturday physiotherapy service helped patients to meet their rehabilitation goals sooner? Why? • How satisfied were you with the service? (5-point Likert Scale)
Other	• Comments?	• Comments?	• Comments?

6.4 Results

6.4.1 Participants

Across three time-points, 127 surveys were distributed. Fifty-one participants responded to the surveys, resulting in a total of 64 responses (50% response rate). Table 6-2 shows the proportion of respondents by occupation for each survey. Nine participants completed all three surveys, and six participants completed two surveys.

6.4.2 Pre-implementation survey

When asked about ideal service delivery, participants were asked to select from several options. Half of respondents reported therapy should occur in the gym, and 28% suggested a combination of gym and ward treatments. The majority preferred a combination of individual and group therapy (64%). To evaluate the 6-day service, in response to open-ended questions, respondents suggested collecting data on LOS (67%), patient satisfaction (38%), and functional outcomes (29%). Respondents suggested allocating patients to the service who were unable to exercise independently (19%), safe to manually handle with one person (10%) and late week admissions (10%), but not medical patients (10%), or those awaiting nursing home placement (10%). It was suggested that patient motivation (24%), dependence of the patient (19%), fatigue levels (19%), and date of discharge (14%) should also be considered when allocating patients. Respondents suggested that between four and 16 patients should be treated on Saturday, depending on treatment location, staffing, dependence of patients, and cost-effectiveness.

Table 6-2: Number (%) respondents to each survey.

Discipline	Total respondents n (%)	Pre-implementation n (%)	Post-implementation n (%)	Post-modification n (%)
Physiotherapist	20 (39%)	8 (38%)	9 (45%)	5 (22%)
Nursing staff	12 (23%)	4 (19%)	3 (15%)	7 (30%)
Occupational therapist	8 (16%)	6 (29%)	4 (20%)	4 (18%)
Rehabilitation doctor	4 (8%)	2 (9%)	3 (15%)	3 (14%)
Dietitian	1 (2%)	-	-	1 (4%)
Speech pathologist	1 (2%)	1 (5%)	-	1 (4%)
Allied health assistant	1 (2%)	-	-	1 (4%)
Allied health manager	1 (2%)	-	-	1 (4%)
Not stated	1 (2%)	-	1 (5%)	-
Total	51 (100%)	21/40 (53%)	20/41 (48%)	23/46 (50%)

n = number

6.4.2.1 Barriers and facilitators

Table 6-3 outlines reported potential barriers to the service. All respondents (n = 21, 100%) identified barriers, with the most prevalent being those related to staffing (62%), including availability, rostering, safety and experience. Respondents also voiced concerns about nursing expectations, allocation of patients, patient issues, effectiveness of the service and cost.

6.4.2.2 Perceived impact on LOS and goal attainment

The majority of pre-implementation survey respondents reported they were unsure whether the 6-day service would reduce LOS or affect patient goal attainment (Table 6-4). This was due to discharge date decision-making processes (*'most of our discharge dates are set with doctors, and they would be the final say'* (S01)), amount of extra therapy patients would receive (*'depends on how much therapy patients will get'* (S10)), and requirements from other disciplines *('if mobility and balance are their primary limiting factors, however not necessarily if they are cognitive/speech related etc'* (S07)). Nearly 20% of respondents felt the 6-day service would reduce LOS (Table 6-4), as patients would spend more time in

Table 6-3: Number (%) of respondents identifying initial barriers and subsequent suggested improvements to implementing a 6-day rehabilitation physiotherapy service.

Pre-implementation barriers		Post-implementation improvements		Post-modification improvements	
Staff – availability, safety, rostering, experience	17 (62%)	Staff – rostering, rehabilitation experience	4 (20%)	Staff – increased staffing, staff experience	4 (17%)
Nursing staff – expectations, porterage	6 (29%)		-	Nursing staff – training, porterage continuity	4 (17%)
Allocation of patients – prioritisation/selection of patients	6 (29%)	Allocation of patients – increase number of patients selected	1 (5%)	Allocation of patients – increase number of patients selected, increase days service provided	3 (13%)
Patient – fatigue, motivation, visitor impact	6 (29%)	Patient – day leave, timing of treatment	2 (10%)		-
Effectiveness of service provision – use of gym, evaluation	5 (24%)		-	Effectiveness of service provision – increase intensity	1 (4%)
Multidisciplinary staffing	3 (14%)		-	Multidisciplinary staffing	2 (9%)
Time	1 (5%)		-		-
Cost	1 (5%)		-		-

therapy (*'yes because they will be more involved in gym more days a week'* (S20)), and it would benefit late week admissions. However, there were conflicting views as to whether patients with longer or shorter LOS would benefit most from the 6-day service.

Respondents who felt patients would have faster goal attainment believed this would be due to increased intensity of practice (*'increased therapy days in one week'* (S04)), and reduction in rest days (*'reduced the 2 day break over the weekend when patients can lose 'carry over' of therapy/strategies or decrease motivation'* (S04)). However, some felt this would only be seen in specific groups of patients (e.g. orthopaedic or neurological patients, or late week admissions), and more dependent patients would not receive this benefit. Three respondents commented that the 6-day service would only impact physiotherapy goals (*'rehab is not just physiotherapy … all disciplines should be involved. Physiotherapy*

Table 6-4: Staff perceptions (number (%)) of the impact of a 6-day service on LOS and faster patient goal attainment in rehabilitation.

	Pre-implementation n=21		Post-implementation n=20		Post-modification n=23	
Will the 6-day service improve:	LOS	Faster goal attainment	LOS	Faster goal attainment	LOS	Faster goal attainment
Yes	4 (19%)	8 (38%)	6 (30%)	9 (45%)	12 (52%)	12 (52%)
No	3 (14%)	2 (10%)	5 (25%)	2 (10%)	2 (9%)	2 (9%)
Unclear	14 (67%)	11 (52%)	8 (40%)	7 (35%)	6 (26%)	6 (26%)
No Response	0	0	1 (5%)	2 (10%)	3 (13%)	3 (13%)

LOS = Length of stay, n = number

goals may be reached only, not any others' (S01)). Respondents who did not think providing a 6-day service would result in faster goal attainment (10%) were concerned about the amount and quality of therapy patients would receive during the Saturday service.

6.4.3 Post-implementation survey

6.4.3.1 Strengths and improvements

Following implementation of the 6-day service, 70% of staff reported no problems with the service, and only six staff (30%) reported issues. Problems identified (Table 6-3) included staff rostering and experience, timing of therapy, impact on patient leave, and increasing the service to allow more patients to attend. Suggestions for solving these issues included increasing the number of physiotherapists working the 6-day service, allocating patients to a regular therapy time and earlier notification of patients to be included in the service for leave planning.

When asked what worked well with the 6-day service, 50% of staff stated the assistant-in-nursing staff member was very helpful. Suggestions for improvements included staffing the service with rehabilitation physiotherapists, as these staff *'have a better understanding of the patients as a whole and understand what treatment is more effective'* (S01), and increasing numbers attending group sessions. Other improvements included allocating more dependent patients to the service, increasing Saturday physiotherapy staffing, timing

of treatments, and nursing staff education. The majority of staff felt patient allocation was appropriate (70%).

6.4.3.2 Perceived impact on LOS and goal attainment

Post-implementation, more staff thought the service reduced LOS (30%) compared to pre (19%), with fewer unsure (40% compared to 67%), (Table 6-4) - *'my impression is that we are having a greater turnover of patients and thus more available beds to accommodate turnover'* (S11). Some respondents felt the increased service may have reduced LOS for some populations (e.g. short stay, weekend admissions). Three respondents felt LOS was determined by many factors and discharge dates were set regardless of whether patients received 6-day physiotherapy. More respondents also felt patients were meeting their goals sooner post-implementation of the 6-day service (45% compared to 38% previously), and fewer were unsure compared with pre-implementation (35% compared to 52%) (Table 6-4). Five respondents felt having the 6-day service reduced the weekend break, therefore avoiding patient *'slip-back' 'for short-stay patients (<1week) especially; helps build confidence and reinforce exercise/progression'* (S18).

6.4.4 Post-modification survey

6.4.4.1 Strengths and improvements

Positive feedback following implementation of the modified service included porterage and assistance (17%), extra therapy provision (17%), perceived reduced weekend rest times

(13%), and appropriate patient selection (13%). The most overwhelming improvement suggestions involved increasing the service (staffing, hours, multidisciplinary service provision or intensity) to allow more patients to attend (61%) (Table 6-3). Almost three-quarters of staff rated that they were satisfied or very satisfied with the service post-modification. Staff reported patients enjoyed attending 6-day physiotherapy and were keen to exercise and improve.

6.4.4.2 Perceived impact on LOS and goal attainment

In the post-modification survey, more than half of respondents felt LOS had been reduced (Table 6-4). This upward trend was also found for perceived goal attainment. Staff commented that the weekend disrupted the momentum of patients, and that 6-day service provision by rehabilitation staff enabled patients to maintain progress and motivation, consolidate skills learnt later in the week, and capitalise on weekday gains without losing progress over the weekend. Staff who felt there was no impact on LOS again commented that discharge date decisions were controlled by doctors, and that setting discharge dates involved more than extra physiotherapy.

6.5 Discussion

This study reports a formative evaluation utilising staff feedback to implement a 6-day rehabilitation physiotherapy service, and enabled the investigation of adoption, acceptability, appropriateness and feasibility of the service. Prior to implementing the

service, staff felt therapy should be provided in the therapy gym, with both group and individual sessions. Initially, many barriers to providing a 6-day service were reported, the majority related to staffing. However, following implementation of the 6-day service, most staff reported no concerns. Initially respondents were unsure whether the 6-day physiotherapy service would reduce LOS and achieve faster goal attainment. Post-implementation of the service, respondents felt that faster goal attainment was achieved, however remained unsure of the impact on LOS. Following modification of the 6-day service to staffing with physiotherapists currently working in rehabilitation, respondents reported they perceived a reduction in LOS with faster goal attainment.

Potential barriers identified prior to implementing this service were generally not reported as issues once the service was implemented. This suggests that gathering staff feedback on potential barriers prior to implementation provided an opportunity to troubleshoot these issues, reducing their impact on the service (McCluskey & Cusick, 2002; Melton & Hartline, 2010). The large number of barriers identified prior to implementing the service may have reflected initial resistance to change, which is common (McCluskey & Cusick, 2002). However, seeking staff member viewpoints (Melton & Hartline, 2010), addressing their concerns and allowing their participation in planning for a change to service delivery (McCluskey & Cusick, 2002) helps ensure greater staff support and acceptability of new initiatives (Waddell & Sohal, 1998). Utilising this process resulted in successful implementation and modification of the 6-day service over several years.

Physiotherapy staffing was consistently identified as a barrier to Saturday service provision. Pre-implementation these concerns were around the number, availability and experience of staff. Post- implementation, these barriers related to staffing experience and consistency, while post-modification of the service, staffing comments were more focused on providing a better service – more experienced physiotherapists, increased staff numbers, and expanding to a multidisciplinary service on a Saturday. Previous trials have utilised physiotherapy and occupational therapy staffing of a weekend service, finding this to be likely cost effective (Brusco et al., 2014), with improvements in functional independence, QOL and LOS (Peiris, Shields, et al., 2013).

Staff supported the 6-day service at all time-points, however, they also felt improvements could be made. Responses to the post-implementation and post-modification surveys supported the inclusion of more dependent patients in the 6-day service. Although patients with lower functional independence have longer LOS (Hayward, Kuys, et al., 2014; Heinemann et al., 1994; Reistetter et al., 2010), patients with severe motor disabilities make significant functional gains with rehabilitation (Hayward, Kuys, et al., 2014) and have been shown to make greater gains over the same timeframe as patients with less severe motor disability (Kuys et al., 2016). Thus, including these patients in the 6-day service may potentially increase these functional gains. However, with one physiotherapist staffing this 6-day service it was difficult, and potentially unsafe, to include these patients for mobility retraining. Including more dependent patients may still be beneficial and reduce 'slip-back' in progress over the weekend providing adequate assistance is provided. Respondents also

suggested that providing a longer Saturday service could enable more patients to be treated or provide longer sessions. Trials investigating rehabilitation weekend therapy to date have used a full-day staffing model (Brusco et al., 2007; Peiris, Shields, et al., 2013), however this was unable to be accommodated within this service due to staffing limitations. The impact of half-day compared to full-day service delivery requires further investigation. Expansion to a multidisciplinary service was also suggested. Previous trials have utilised physiotherapy and occupational therapy staffing of a weekend service, finding this to likely be cost effective (Brusco et al., 2014), with improvements in functional independence, QOL and LOS (Peiris, Shields, et al., 2013).

Viewpoints about goal attainment and LOS changed across implementation phases. Pre-implementation, staff were unclear as to whether the service would change LOS or goal attainment, but at the post-modification phase, most reported a positive impact. As the 6-day service found improvements in functional independence and a trend towards a reduction in LOS (Chapters 4 and 5), this may reflect the change in staff perceptions. While these perceptions improved, only half of respondents reported these positive perceptions. Respondents identified that this may be because discharge dates are influenced by a variety of factors (e.g. medical reviews (Fontaine et al., 2011), discharge planning (Goncalves-Bradley, Lannin, Clemson, Cameron, & Shepperd, 2016; McDonagh, Smith, & Goddard, 2000), or social issues (McDonagh et al., 2000)), which a 6-day physiotherapy service may not impact. Respondents also commented that the 6-day service would only address physiotherapy goals. As the majority of patients were admitted to rehabilitation with

reduced functional independence, it may be that patients achieved their physiotherapy goals sooner, but not necessarily other functional goals.

6.5.1 Limitations

Firstly, survey participation was voluntary, which resulted in response rates of approximately 50% at each time point. This response rate is similar to that typically achieved (56%) with paper surveys (Baruch, 1999), but above the 40% average response rate found in one meta-analysis of internet-based surveys (Cook, Heath, & Thompson, 2000). However, given the spread of occupations, it is reasonable to assume that most stakeholder groups working in the rehabilitation unit responded to the survey, providing a broad perspective of the impact of this 6-day service. This is important as the representativeness of a sample is often more valuable than the sample size (Cook et al., 2000). The voluntary nature of the survey could mean only staff interested or invested in the 6-day service provision responded to the survey, which could lead to positively biased responses (Porter, 2004). All endeavours to increase response rate (reminder emails and signs) were taken during survey collection periods. Secondly, the surveys were completed by different people at different time points, reflecting a rotational staffing model. Thus, different staff perspectives were captured in each survey, making it difficult to accurately track changing perceptions of the service. Third, staff surveys were chosen as the research methodology in this study as this enabled feedback to be obtained from all disciplines, regardless of working hours or time limitations. The use of staff interviews or focus groups may have led to more detailed discussion, or greater clarification of some of the information

provided by participants. However, the surveys utilised both open and closed-ended questions, which allowed for participants to voice their perspectives in their own words. Finally, patient perspectives are important to consider when reviewing service delivery and were not sought in this study.

6.6 Conclusion

Rehabilitation staff were supportive of a 6-day rehabilitation physiotherapy service implementation. Implementing and adjusting the 6-day service incorporating staff feedback lead to increased perceptions of faster patient goal attainment and reduced patient LOS. These findings highlight the importance of seeking staff feedback when translating evidence into clinical practice and implementing new services in rehabilitation. Utilising staff feedback in planning and evaluating a service can lead to increased staff support, ensuring services are provided smoothly and maximising patient outcomes.

Chapter 7 – Study 4 – Allied health weekend service provision in Australian rehabilitation units

Caruana, E. L., Kuys, S. S. and Brauer, S. G. (2018). Allied health weekend service provision in Australian rehabilitation units. *Australasian Journal on Ageing*, *32*(2), E42-48.*

The pilot survey was conducted in 2011 of a purposively selected sample of Australian rehabilitation units. Findings highlighted that weekend allied health service provision largely occurred in large private rehabilitation facilities in capital cities. However, it is likely that findings were limited by the sample which comprised a high proportion of local facilities and only a few facilities from throughout the remainder of Australia. Therefore, a larger national survey is required to gain a clearer picture about weekend service provision in rehabilitation nationally. The pilot study also raised further questions regarding staffing comparisons between weekday and weekend services. A formative evaluation of the implementation of a 6-day service in a private, metropolitan rehabilitation unit (Chapter 6) raised questions regarding the barriers and facilitators to providing a weekend rehabilitation service and staff perspectives at a local level, which would be beneficial to explore on a national level. Therefore, a more comprehensive national survey was required to determine weekend service provision across all rehabilitation facilities in Australia. An electronic survey was used to investigate this, as well as explore clinician perspectives of weekend service provision, and barriers and facilitators to providing a rehabilitation weekend service.

*Minor adaptations to the paper have been made to be included in this thesis. For full paper, see Appendix 3d.

7.1 Abstract

Aim: To investigate current rehabilitation weekend service provision in Australia, and staff perceptions of barriers and facilitators to providing this service.

Methods: Senior physiotherapists from Australian rehabilitation units completed an online cross-sectional survey exploring current service provision, staffing, perceived outcomes, and barriers and facilitators to weekend service provision.

Results: A total of 84% (n=179) of eligible units responded, with 93 facilities (57%) providing weekend therapy. A Saturday service was most common (97%) with the most frequent service providers being physiotherapists (90%). Rehabilitation weekend service was perceived to increase patient/family satisfaction (66%) and achieve faster goal attainment (55%). Common barriers were budgetary restraints (66%) and staffing availability (54%), with facilitators including organisational support (76%), staff availability (62%) and support (61%).

Conclusion: Despite increasing evidence of efficacy, only half of Australian rehabilitation facilities provide weekend services. Addressing clinician perspectives on acceptability regarding providing a rehabilitation weekend service may result in greater adoption of these services in the future.

7.2 Introduction

With an ageing population (AIHW, 2013) and increasing need for rehabilitation (AROC, 2013a), methods to increase efficiency and reduce LOS in inpatient rehabilitation are required. Providing more physiotherapy to patients in rehabilitation reduces LOS and improves patient outcomes (Kwakkel et al., 2004; Peiris et al., 2011). Weekend service provision is one method to increase access to physiotherapy. Several RCTs have found improvements in QOL, functional independence (Peiris, Shields, et al., 2013), patient flow (DiSotto-Monastero et al. 2012; Hakkennes et al., 2015) and likely cost effectiveness (Brusco et al., 2014, 2015), with a trend towards a reduction in LOS of up to three days (Brusco et al., 2007; Peiris, Shields, et al., 2013) with weekend therapy in rehabilitation. In 2011, only 30% of Australian rehabilitation facilities surveyed provided weekend physiotherapy (Shaw et al., 2013). However, no information was provided on multidisciplinary service provision. Rehabilitation is a complex service, with therapy typically provided by a multidisciplinary team (Australasian Faculty of Rehabilitation Medicine, 2011). It is timely to review Australian weekend rehabilitation provision; specifically, to see what, if any, changes have occurred, if adoption (uptake) has increased, and to investigate multidisciplinary rehabilitation weekend service provision.

Although increased patient satisfaction has been reported with weekend service delivery in rehabilitation (Hooper & Dijkers, 1987), few studies have investigated clinician perspectives to determine its' acceptability. Underpinning staff acceptability are perceived barriers and facilitators. Staffing costs and coverage have been found to be barriers to weekend rehabilitation provision (Hooper & Dijkers, 1987), although facilitators and clinician

perspectives regarding the effectiveness of weekend rehabilitation have not been investigated. Involving staff when implementing a new service is key to the effectiveness, success and adoption of a service (Shee et al., 2014). Positive staff attitudes (Melton & Hartline, 2010) and commitment to the service are both necessary for service change to be successful (Kotter & Schlesinger, 2008). Therefore, it is pertinent to gauge clinician support for weekend rehabilitation services.

This study aimed to investigate current rehabilitation weekend service provision in Australia, and clinician perceptions of barriers and facilitators to providing this service.

7.3 Methods

An online survey of senior physiotherapists from Australian rehabilitation units was conducted to characterise current weekend rehabilitation service provision and clinician perceptions of barriers and facilitators to providing this service.

7.3.1 Participants

Australian rehabilitation units were identified from state and private hospital listings, and AROC reports (AROC, 2016b). AROC is the national clinical registration of rehabilitation medicine in Australia and New Zealand, and is a joint initiative of providers, funders, regulators and consumers of the Australasian rehabilitation sector (AROC, 2016b). To be eligible for inclusion in this study facilities had to be located in Australia, have a designated rehabilitation unit (defined as a separate dedicated unit providing multidisciplinary care by

experienced staff, with dedicated therapy areas (Consultative Committee on Private Rehabilitation,2016)), and provide physiotherapy daily on weekdays. A senior rehabilitation physiotherapist at each eligible facility participated in the survey providing only one response per rehabilitation unit. If a facility had more than one rehabilitation unit, then appropriate staff were asked to complete one survey for each unit (e.g. a facility having separate spinal and brain injury rehabilitation units). A participant information statement was included in the survey, and each participant was required to provide their informed consent prior to continuing with the survey. Ethical approval for this study was granted by the University of Queensland Medical Research Ethics Committee (Appendix 1).

7.3.2 Survey

The survey was developed from a pilot study completed in 2011 (Chapter 3), previous literature investigating weekend allied health service provision (Brusco et al., 2007; Campbell et al., 2010; DiSotto-Monastero et al., 2012; Hill & Brooks, 2010; Hooper & Dijkers, 1987; Ottensmeyer et al., 2012; Peiris, Shields, et al., 2013; Ruff et al., 1999; Shaw et al., 2013), and staff perceptions from a formative evaluation completed with the implementation of a 6-day physiotherapy service in a private Australian rehabilitation unit (post-implementation and post-modification surveys, Chapter 6). The survey was conducted electronically using SurveyMonkey®, over two one-month periods (December 2015 and February 2016). A combination of closed-ended questions, and a rating scale were used to collect data on weekend service provision. A number of these closed-ended questions were presented as open-ended questions in the pilot study (Chapter 3) and

formative evaluation (Chapter 6) and were summarized as options to choose from in this survey. An open-ended section for other information was usually included if this was the case. The survey was piloted with several physiotherapists, and feedback sought on content, clarity, appropriateness of questions and usability prior to implementation. The survey was then amended as required to ensure optimal facilitation of responses. A copy of this survey can be found in Appendix 2c.

7.3.3 Outcome measures

Outcome measures collected included demographic information of each rehabilitation unit, including total bed numbers, types of patients admitted, funding source, weekday staffing levels, and whether a weekend service was provided. Of those hospitals providing a weekend rehabilitation service, information was sought on current weekend service provision and implementation of the service, including staffing levels, disciplines, days and hours service provided, employment status of staff and rostering. Patient information, including number of patients treated by the weekend service and selection criteria used to determine eligibility for the service was also explored. The survey also enquired whether any benchmarking had been completed prior to the commencement of the service, as well as any evaluation of the weekend service since implementation. Barriers and facilitators for weekend therapy services were investigated in all participants, regardless of whether a weekend service was provided. Clinician perceptions of weekend service provision were also investigated, using a rating scale.

7.3.4 Data analysis

Descriptive statistics were reported for closed-ended questions including frequencies (e.g. number of responses from each state), means and standard deviation (SD) (e.g. average bed size of facilities) as appropriate, percentage of respondents, frequency providing a weekend rehabilitation service, hospital demographics, weekend service staffing and implementation, and participant perceptions of weekend physiotherapy service provision. Statistical analysis using Mann Whitney U tests were used to compare clinician perspectives of facilities depending on whether a weekend service was provided. SPSS (version 23, Chicago, IL) was used to complete the statistical analysis, using $p < 0.05$ to indicate statistical significance.

7.4 Results

A total of 312 facilities were identified in Australia as providing rehabilitation. From this, 73 facilities were excluded, as there was no dedicated rehabilitation unit (n=60), rehabilitation was no longer offered (n=10), or they did not provide daily weekday physiotherapy (n=3). Three facilities declined to participate in the survey, and 22 were unable to be contacted. A total of 214 contacted rehabilitation units agreed to participate in the survey. Of these, 179 participants completed the survey (response rate 84%).

7.4.1 Demographics

Demographic information of responding rehabilitation units is listed in Table 7-1. Most facilities were located across three east coast states – New South Wales, Victoria and

Table 7-1: Demographic data of rehabilitation units

Variable	Total n=162	Weekend therapy provided	Weekend therapy not provided
Weekend therapy provision, n (%)		93 (57)	69 (43)
State, n (%)			
ACT	4 (2)	1 (1)	3 (4)
NSW	65 (40)	36 (39)	28 (41)
NT	-	-	-
QLD	35 (22)	17 (18)	18 (26)
SA	4 (2)	3 (3)	1 (1)
TAS	4 (2)	3 (3)	1 (1)
VIC	37 (23)	24 (26)	12 (19)
WA	13 (8)	8 (9)	5 (7)
Area, n (%)			
Metropolitan	85 (53)	56 (60)	28 (41)
Regional	58 (36)	29 (31)	29 (42)
Rural	16 (10)	4 (4)	12 (17)
Funding, n (%)			
Public	87 (54)	24 (26)	62 (90)
Private	69 (43)	63 (68)	6 (9)
Other	5 (3)	4 (4)	1 (1)
Diagnostic criteria, n (%)			
Stroke	134 (75)	74 (80)	60 (87)
ABI/TBI	90 (50)	47 (51)	43 (62)
Spinal cord injury	65 (36)	29 (31)	36 (52)
Other neurology	137 (77)	78 (84)	59 (86)
Orthopaedic	150 (84)	89 (96)	61 (88)
Amputee	101 (56)	55 (59)	46 (67)
Other trauma	115 (64)	72 (77)	43 (62)
Deconditioning	146 (82)	85 (91)	61 (88)
Age, n (%)			
<18 years	26 (15)	14 (15)	12 (17)
45-65 years	147 (82)	84 (90)	63 (91)
> 65 years	153 (86)	88 (95)	65 (94)
Number of beds, mean (SD)	30 (21.2)	35 (24.5)	22 (12.8)

ABI/TBI = acquired brain injury/traumatic brain injury, ACT = Australian Capital Territory, n = number, NSW = New South Wales, NT = Northern Territory, QLD = Queensland, SA = South Australia, SD = standard deviation, TAS = Tasmanian, VIC = Victoria, WA = Western Australia.
Data represents all responses received for each question. Seventeen respondents did not reply to the questions. The remaining respondents answered all questions except for area (three missing), funding (one missing), diagnosis (two missing) and age (three missing).

Queensland (77%). Almost half of the facilities were in metropolitan areas (53%) and were publicly funded (54%). The most common diagnoses treated in the rehabilitation facilities included orthopaedic, deconditioning, other neurological conditions and people with stroke. Over 85% of facilities treated patients over the age of 65 years, and units had on average 30 beds.

7.4.2 Weekend service provision

More than half of the facilities surveyed (57%) provided a weekend service (Table 7-1). Facilities providing weekend services were most commonly located in metropolitan areas (60%) and were privately funded (68%). Of those providing a weekend therapy service, 90 facilities provided a Saturday service, and 36 provided a Sunday service (one facility providing a Sunday service did not provide a Saturday service) (Table 7-2).

Both Saturday and Sunday services were most commonly staffed as a half day service (>64%), with physiotherapists (>70%) and physiotherapy or allied health assistants (>22%). Less than one in five facilities provided occupational therapy services, regardless of the day provided. Speech pathology and social work were provided in approximately one in seven facilities, while less than one in ten facilities provided dietetics, psychology and discharge coordinators. Most facilities treated between 5-20 patients during the Saturday or Sunday service.

Table 7-2: Weekend service provision on Saturday and Sunday.

Variable	Saturday				Sunday			
Facilities providing weekend service, n (%)	90 (97)				36 (39)*			
Length of service, n (%)								
Half day	61 (67)				23 (64)			
Whole day	28 (30.1)				13 (36)			
Facilities providing, n (%), average FTE								
Physiotherapy	82 (91), 2 FTE				26 (70), 2 FTE			
Physiotherapy assistant	48 (53), 2 FTE				16 (43), 2 FTE			
Occupational therapy	17 (19), 1 FTE				7 (19), 2 FTE			
Occupational therapy assistant	10 (11), 1 FTE				4 (11), 1 FTE			
Speech pathology	15 (17), 1 FTE				4 (11), 1 FTE			
Speech pathology assistant	7 (8), 1 FTE				3 (8), 1 FTE			
Dietitian	7 (8), 1 FTE				3 (8), 1 FTE			
Social worker	7 (8), 1 FTE				5 (14), 1 FTE			
Psychologist	6 (7), 1 FTE				3 (8), 1 FTE			
Discharge coordinator	6 (7), 1 FTE				3 (8), 1 FTE			
Allied health assistant	20 (22), 2 FTE				9 (24), 2 FTE			
Number of patients treated (number of patients = number of facilities)	<5	5-10	11-20	>20	<5	5-10	11-20	>20
Physiotherapy	11	24	24	17	5	6	7	5
Physiotherapy assistant	1	9	17	11	1	2	5	3
Occupational therapy	2	5	1	1	1	1	1	0
Speech pathology	7	1	0	0	1	0	0	0
Allied health assistant	0	5	7	0	0	1	1	2

* one facility providing Sunday therapy did not provide Saturday therapy, FTE = Full time equivalent, n = number

Approximately one-third (34%) of rehabilitation units had been providing a weekend service for 3-5 years. Nineteen percent of facilities had been providing a weekend service between 6-10 years, 24% of facilities had been providing weekend services for more than 10 years, whilst 23% of units implemented a weekend service in rehabilitation in the last two years. Half of respondents not currently providing a weekend service would consider providing a weekend service in the future, with 13% currently planning the implementation of this service. When criteria for receiving weekend therapy were examined, the most common criteria respondents selected for patients to be included

in weekend therapy (see Figure 4-1) were patients likely to benefit from more intensive rehabilitation (59%), likely to deteriorate (56%), all patients (46%), happy to participate in weekend therapy and late week or new admissions (45% each).

While approximately half of the facilities (46%) were unsure whether any prior research or benchmarking had been completed before the implementation of weekend services, 43% of facilities reported that this had not been completed. Those facilities that had carried out prior research (11%) utilised literature reviews, benchmarking with other facilities and patient or staff surveys. Eighty-five percent of facilities reported evaluating their weekend

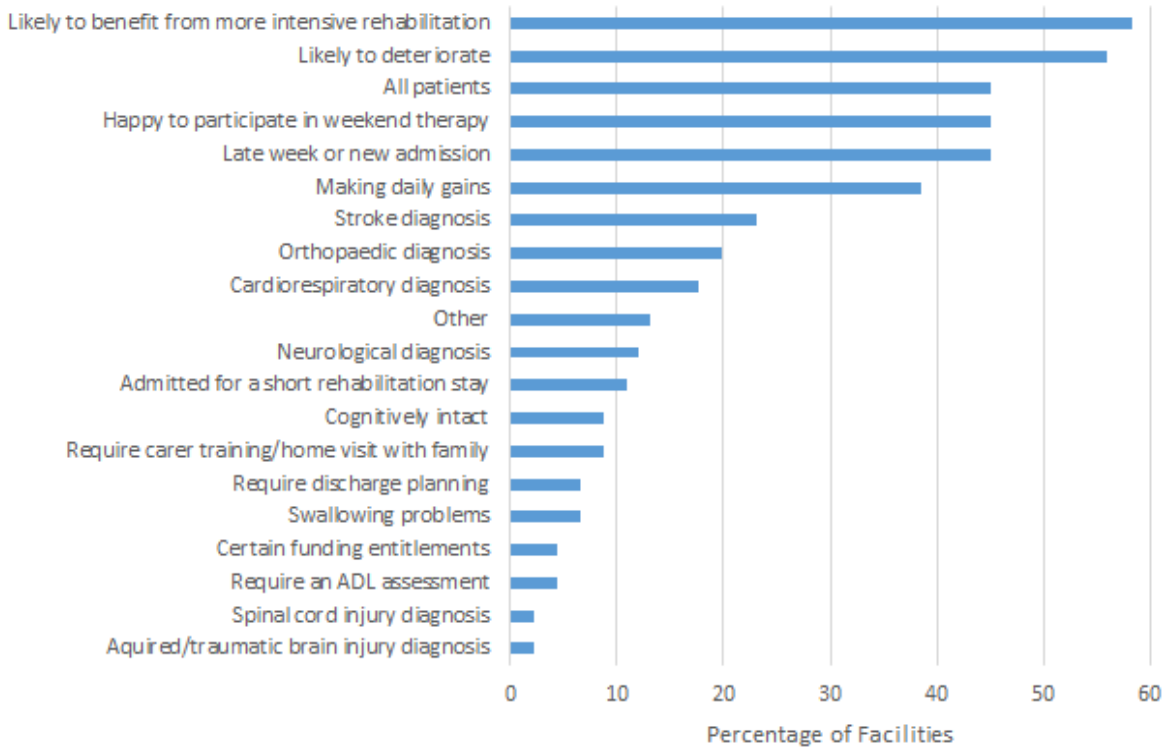

Figure 7-1: Percentage of facilities utilising criteria for patients to be included in weekend therapy.

Other = oedema management, level of dependence of patients, or requiring social activities.
ADL = activities of daily living.

service post implementation. Nearly 80% of facilities collected data using the FIM, AROC data and LOS. Additional outcomes collected to evaluate weekend service provision included usual workforce statistics (60%), patient/family/staff satisfaction measures (60%), Modified Barthel Index (10%) and patient QOL measures (6%). The reported perceived benefits of rehabilitation weekend service provision included increased patient/family satisfaction (70%), faster goal attainment (59%), reduced LOS (48%) and improvements in mobility at discharge (44%).

7.4.3 Barriers and facilitators for providing weekend therapy

Barriers and facilitators to providing a weekend service identified by survey respondents are outlined in Figure 7-2a and b. The most common barriers identified by facilities providing a weekend service were budgetary restraints, staffing availability and patient factors such as participation/motivation, and fatigue (Figure 7-2a). Those facilities not providing a weekend service also identified budgetary restraints and staffing availability as major barriers, but more frequently rated organisational support as a barrier. Facilitators to providing a weekend service were again similar whether or not weekend service was provided, with both groups identifying organisational support, staffing availability and staff support as important facilitators (Figure 7-2b). However, those providing a weekend service also reported patient/family satisfaction as an important facilitator, while those facilities not providing a weekend service reported that financial support and evidence of outcomes were important factors to facilitate the provision of a weekend therapy service.

Figure 7-2a

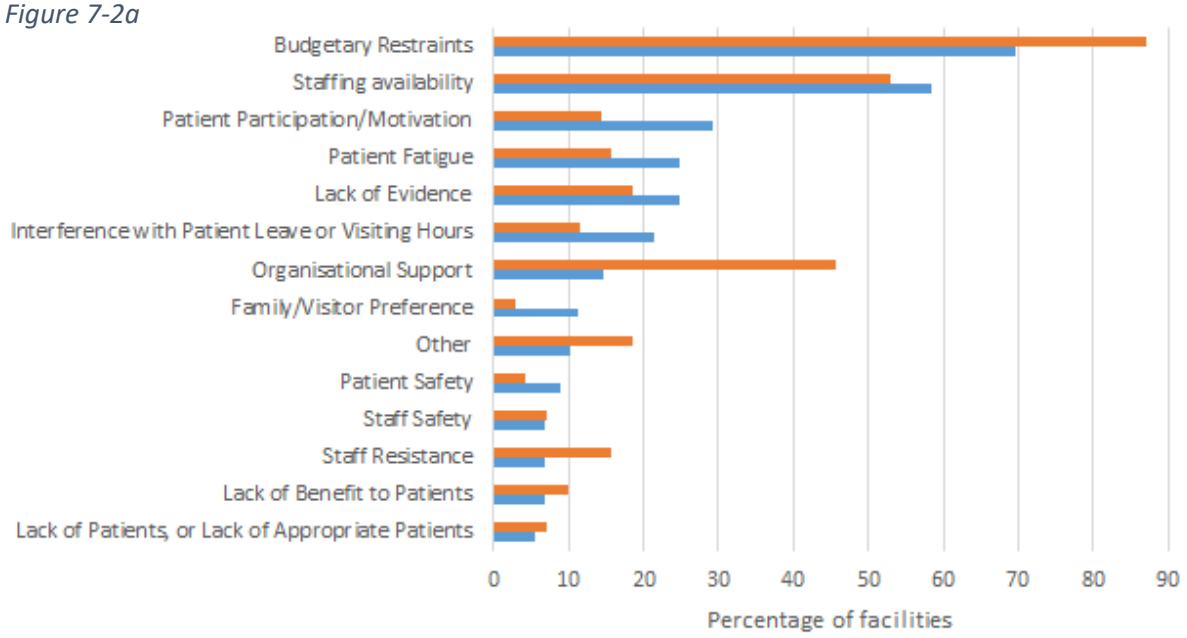

Figure 7-2b

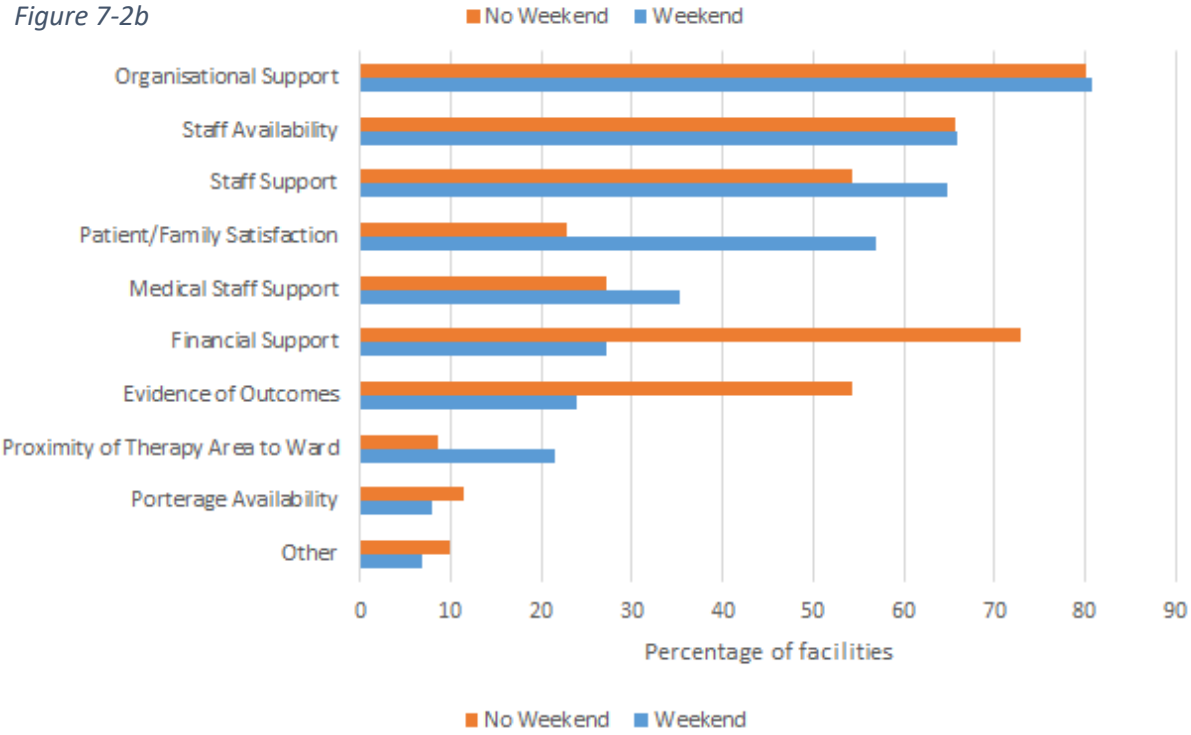

Figure 7-2: Barriers (Figure 7-2a) and facilitators (Figure 7-2b) of providing a weekend service in rehabilitation.

Table 7-3: Clinician perspectives of weekend service provision

Weekend service provision…	Weekend physiotherapy service					No weekend physiotherapy service				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Will not facilitate family practice	0%	12%	40%	40%	8%	0%	9%	36%	46%	9%
Will not lead to improved QOL for patients	1%	5%	30%	48%	16%	1%	3%	34%	45%	17%
Is not an effective use of staff resources	3%	6%	19%	47%	25%	2%	9%	31%	39%	19%
Will not lead to reductions in average LOS	4%	6%	21%	55%	14%	3%	11%	28%	47%	11%
Should be staffed by current rehabilitation staff	6%	31%	33%	22%	8%	6%	41%	28%	20%	5%
Will not enable increased weekend admissions	9%	18%	27%	33%	13%	3%	28%	28%	34%	7%
I am satisfied with weekend service at my facility	9%	45%	21%	18%	7%	8%	16%	26%	36%	14%
Will not interfere with patient/family/visitor time	12%	39%	26%	22%	1%	8%	40%	23%	28%	1%
Will affect the setting of discharge dates	14%	50%	18%	16%	2%	8%	41%	27%	21%	3%
Should be multidisciplinary	20%	41%	30%	8%	1%	40%	42%	12%	6%	0%
Achieve faster goal attainment	24%	60%	14%	1%	1%	15%	54%	25%	6%	0%
Reduces slip-back of progress over the weekend	24%	63%	12%	1%	0%	33%	43%	13%	9%	2%
Effective method to increase intensity of practice	37%	49%	9%	5%	0%	37%	49%	12%	2%	0%
Is safe for patients	40%	49%	10%	1%	0%	34%	54%	8%	4%	0%
Increases patient activity	47%	47%	4%	1%	1%	34%	58%	6%	2%	0%

Participants were asked to indicate their agreement with the statements above. LOS = Length of stay, QOL = quality of life

7.4.4 Clinician perspectives

Clinician perspectives of rehabilitation weekend service provision are shown in Table 7-3. Clinicians generally felt that weekend service provision had positive effects for patients. Statistically significant differences were found for several questions, with more clinicians in facilities providing weekend services agreeing that they were satisfied with the weekend service provided and perceiving faster goal attainment when weekend services were provided, compared to clinicians from facilities not providing a weekend service ($p < 0.036$). Significantly more clinicians from facilities not providing weekend therapy agreed that service provision should be multidisciplinary ($p = 0.002$).

7.5 Discussion

Weekend service adoption has increased, at least in Australia, with more than half of rehabilitation facilities surveyed providing weekend therapy services. These facilities were most commonly in metropolitan locations and privately funded. A half-day 6-day service was the most common model of weekend service provision in rehabilitation, with physiotherapy (and therapy assistants) the most common discipline provided. Staff reported barriers and facilitators to weekend service provision are largely the same regardless of whether a weekend service is provided, although financial support was more commonly considered to be a barrier and facilitator in those without a weekend service than in those with a weekend service. Facilities providing a weekend service did not commonly undertake any benchmarking or literature reviews prior to implementing the weekend service. FIM, AROC and LOS data were commonly used to evaluate the

effectiveness of weekend service provision, with the most common perceived benefits including increased patient/family satisfaction, faster goal attainment and reduced LOS. Clinicians acceptability was generally supportive of weekend service provision in rehabilitation, and generally felt these services resulted in positive outcomes for patients.

This survey allowed for the investigation of adoption, acceptability and feasibility of weekend service provision in rehabilitation. Increasing numbers of Australian rehabilitation facilities are adopting weekend therapy services compared to 2011 (Shaw et al., 2013). This is consistent for both Saturday and Sunday service provision; however, Sunday provision remains less than half that provided on Saturday. Whilst the adoption of rehabilitation weekend service provision appears to be growing in Australia, it is still below that reported in America where in 1987, 82% of surveyed hospitals provided a weekend rehabilitation service (Hooper & Dijkers, 1987). This increase in Australian weekend service provision since 2011 could be due to recently reported positive benefits for patients from efficacy studies such as increased QOL and functional independence (Peiris, Shields, et al., 2013) with a trend towards reduced LOS (Brusco et al., 2007; Peiris, Shields, et al., 2013), which could have increased acceptability of weekend services in rehabilitation. While the LOS reductions in these studies have not reached statistical significance, the confidence intervals were very close to 0 (mean difference 3.2 days, 95% CI –0.5 to 6.9 with the provision of a 6-day physiotherapy service (Brusco et al, 2007) and mean difference 2 days, 95% CI 0 to 4 with the provision of a 6-day multidisciplinary service (Peiris, Shields et al., 2013)), suggesting that it is more likely the true mean lies 'over the line'. This would likely lead to reduced LOS in the majority of participants in the experimental group, up to 4 or 6.9 days in

some participants. These findings are likely to be clinically significant and could result in cost savings for rehabilitation units. Two recent studies based off Peiris and colleague's investigation of 6-day physiotherapy and occupational therapy services in rehabilitation (Peiris, Shields, et al., 2013) have also found that these weekend rehabilitation services are likely cost effective both at 30 days (Brusco et al., 2014) and 12 month following discharge (Brusco et al., 2015). These are important considerations to increase feasibility, given budgetary restraints are identified as the most common barrier to implementing a weekend service and financial support is an important facilitator reported by facilities not providing a weekend service.

Staff at facilities providing weekend services appear to use similar criteria for allocation of patients to weekend services. This is more reflective of 'real world' practice compared to RCT studies investigating the efficacy of 6-day service provision, in which all participants were included (Peiris, Shields, et al., 2013), or participants were excluded if they had cognitive impairment (Brusco et al., 2007).

Almost half the respondents in the current study reported being unsure whether any benchmarking or research had been completed prior to weekend rehabilitation service implementation. Another 40% reported this had not been completed. Despite the low reporting of prior research, 85% of rehabilitation units collected outcome measures to evaluate their service provision with over 70% collecting LOS, FIM, and AROC data. Similar data were collected in previous studies investigating the efficacy of weekend rehabilitation services (Brusco et al., 2007; Peiris, Shields, et al., 2013). Therefore, it seems pertinent that

all rehabilitation units should collect this data, to allow for future benchmarking with the available literature and with other facilities. While these data are objective and easily collected, these outcomes differ from the perceived benefits reported by facilities. Increased patient/family satisfaction, faster goal attainment, reduced LOS and improved patient mobility at discharge were commonly reported by respondents in this study. Few studies investigating weekend service delivery in rehabilitation have investigated patient/family satisfaction or rate of goal attainment; however, studies have found that patients and families would like weekend services (Gill, Dunning, McKinnon, Cook, & Bourke, 2014).

Similarities and differences in clinician perspectives of weekend service provision were found when comparing rehabilitation units providing or not providing a weekend service. Regardless of whether a rehabilitation unit provided a weekend service, respondents agreed that services should be staffed with current rehabilitation staff members, and that services provided should be multidisciplinary. Multidisciplinary staffing is in line with rehabilitation guidelines (Australasian Faculty of Rehabilitation Medicine, 2011; Consultative Committee on Private Rehabilitation, 2016), however more respondents from rehabilitation units not providing a weekend service felt that weekend therapy should be multi-disciplinary. As less than 20% of rehabilitation units providing a weekend service provide a multidisciplinary service, this may explain the reduced support for the need of multidisciplinary service provision in respondents at facilities providing a weekend service. Respondents also felt that rehabilitation weekend services were an effective use of staff resources, and an effective method to increase the intensity of practice for rehabilitation patients. Respondents from

rehabilitation units providing a weekend service were generally more satisfied with the weekend service provided compared with those not providing a weekend service. As approximately half of the units not currently providing a weekend service were considering providing a service in the future, this may explain the dissatisfaction. More respondents from rehabilitation units providing a weekend service felt the provision of a weekend service reduced slip back in progress over the weekend, which may be important to investigate. Respondents were asked to indicate their level of agreement with all statements in the clinician perspectives questions, as there was no option provided for 'not applicable'.

7.5.1 Study limitations

There were several limitations to this study. The target population contacted to complete this survey were senior physiotherapists. This may have led to biased responses and skewed staff perception to only that discipline. Respondents were informed they could pass the survey on to other staff members who may be better placed to answer the survey, however data on the staffing discipline completing the survey was not recorded. It is possible that the sampling strategy missed some facilities with rehabilitation units. However, the sample group was sourced from multiple sources, which provides confidence that all relevant facilities were included in this study. It is possible that the non-respondents and people unable to be contacted may have influenced the findings of this study. Every effort was made to contact representatives at these facilities, including multiple phone calls at different times of the day, days of the week and in both time periods, and multiple

reminder emails regarding their completion of the survey. However, given the small number of facilities unable to be contacted, this is unlikely to have influenced data. The survey did not utilise open-ended questions. As the survey used in this study was developed from the pilot study (Chapter 3) and formative evaluation (Chapter 6), a number of the open-ended questions used in these surveys were summarized into options for participants to choose from in this national survey. It is possible that more detailed information could have been gained from participants if open-ended questioning had been utilised. However, an open-ended section for other comments or information was included for these questions, which allowed participants to provided further details as they felt necessary.

7.6 Conclusion

Almost half of the surveyed rehabilitation units in Australia provided weekend therapy. Services are most commonly provided as half-day 6-day services in private facilities in metropolitan areas, staffed by physiotherapists. This study has provided further insight into how weekend rehabilitation services are currently provided, adoption, acceptability, and barriers and facilitators to providing a weekend rehabilitation service. Clinicians are generally supportive of weekend rehabilitation service provision. Further research is needed to support the implementation of research on weekend rehabilitation services, into practice.

Chapter 8 – Study 5 – Multidisciplinary 6-day rehabilitation service – a pragmatic implementation

Feedback from the formative evaluation study (Chapter 6), as well as clinician perspective outcomes from the national survey (Chapter 7) indicated that clinicians felt a multidisciplinary service should be provided. Despite this not being commonly offered around Australia, the literature is currently investigating this service model, using RCTs and experimental methodologies. One RCT investigating multidisciplinary 6-day rehabilitation service provision has found a reduction in LOS by two days compared to a 5-day service, and a meta-analysis has found a reduction in LOS by 5.7 days with a multidisciplinary 6-day service compared to a physiotherapy only 7-day service. The provision of a multidisciplinary weekend rehabilitation service compared to a physiotherapy weekend service will be investigated in this chapter. The RCT investigating 6-day multidisciplinary weekend service provision in rehabilitation has also investigated the economic impact of delivering this service, finding this service to be likely cost-effective at 30 days and 12 months post discharge. As this thesis is investigating the implementation of weekend service provision in a real world rehabilitation setting, it is pertinent to investigate the implementation costs associated with this.

8.1 Abstract

Aim: This study aims to investigate the effectiveness of a 6-day multidisciplinary service on LOS, functional independence, patient outcomes and implementation costs when compared to a 6-day physiotherapy-only service in a real world setting.

Methods: A prospective cohort study with a historical control was conducted to compare a multidisciplinary and physiotherapy-only 6-day rehabilitation service. LOS, functional independence, clinical measures of gait and balance, service delivery and economic net present value were measured.

Results: A total of 366 patients were admitted to the rehabilitation unit over two 20-week periods. The prospective cohort (multidisciplinary Saturday rehabilitation) had 192 participants and the historical control group (physiotherapy Saturday rehabilitation) had 174 participants). Participants receiving the multidisciplinary service had a significant reduction in LOS (mean difference 2.4 days, 95%CI 0.47 to 4.25) compared to the physiotherapy-only weekend service. Participants in the physiotherapy group had lower total and cognitive FIM scores ($p < 0.078$), and generally performed at a lower level in gait and balance measures on admission compared to the multidisciplinary group. More participants in the multidisciplinary group attended weekend therapy, attending more sessions and spending more time in therapy compared to those receiving the physiotherapy service ($p < 0.012$). Cost-minimisation analysis revealed providing the multidisciplinary service resulted in cost savings for the hospital of more than $280,000.

Conclusions: The implementation of a multidisciplinary Saturday service results in a more efficient service, enabling a greater amount of therapy to be provided over a shorter LOS.

The provision of a multidisciplinary 6-day service lead to a reduction in hospital costs by over $280,000.

8.2 Introduction

Rehabilitation, or rehabilitation care, utilises a multidisciplinary team to provide treatment that aims to improve the functional status of people with a health condition leading to an impairment, activity limitation or participation restriction (AIHW, 2016a). Multidisciplinary allied health therapy services are vital in optimising patient outcomes in rehabilitation and may lead to improvements in function, mortality and fewer nursing home admissions in the geriatric population (Bachmann et al., 2010) and people following hip fracture (Halbert et al., 2007) compared to single discipline care. Multidisciplinary rehabilitation by therapists including physiotherapy, occupational therapy and speech pathology, also leads to greater improvements in QOL, performance of ADLs and improvements in motor and balance impairments compared to the provision of physiotherapy services alone in people with Parkinson's Disease (Monticone, Ambrosini, Laurini, Rocca, & Foti, 2015). Similarly, improvements in motor function has been found in fractured hip populations when receiving multidisciplinary rehabilitation compared to those receiving physiotherapy only care (Taraldsen et al., 2014). The previous chapters of this thesis have investigated the effectiveness of physiotherapy-only models of weekend rehabilitation service provision, however multidisciplinary weekend service provision requires investigation.

The provision of multidisciplinary care has been included in the Australian Faculty of Rehabilitation Medicine guidelines for rehabilitation provision throughout Australia (Australasian Faculty of Rehabilitation Medicine, 2011). The Australian Guidelines for Recognition of Private Hospital-based Rehabilitation Services indicate that these services should be provided over the weekend (Consultative Committee on Private Rehabilitation,

2016). The implementation of a 6-day multidisciplinary service in rehabilitation (physiotherapy and occupational therapy) has been shown to improve functional independence (Peiris, Shields, et al., 2013), QOL (Peiris, Shields, et al., 2013), and demonstrate likely cost effectiveness at 30 days (Brusco et al., 2014) and 12 months post discharge (Brusco et al., 2015) compared to a 5-day service. While a significant reduction in LOS has not been found with 6-day multidisciplinary services (two days) (Peiris, Shields, et al., 2013) or physiotherapy-only services (3.2 days) (Brusco et al., 2007), these reductions may be clinically significant. These results were found using RCT methodology, which while reducing bias, does not always replicate the real world implementation of interventions. It is therefore necessary to investigate the implementation of a 6-day multidisciplinary service in a real world setting.

One factor likely to impact on the decision to implement weekend rehabilitation is the economic impact of the service, from a health system perspective. Two cost utility analyses have evaluated the cost effectiveness of providing multidisciplinary weekend inpatient rehabilitation in Australian public hospitals alongside an RCT. Results suggest that weekend multidisciplinary rehabilitation may be cost saving from the health system perspective for quality-adjusted life years and a minimal clinically important difference in functional independence, however the reported incremental cost effectiveness ratios at 30 days (Brusco et al., 2014) and 12 months post discharge (Brusco et al., 2015) were not statistically significant. While these findings suggest a trend toward an economic benefit with a weekend service in rehabilitation in an RCT, the economic impact of a pragmatic multidisciplinary 6-day therapy service is not yet known.

This study therefore aims to investigate the effectiveness of a 6-day multidisciplinary service on LOS, functional independence, patient outcomes and implementation costs when compared to a 6-day physiotherapy-only service in a real world setting.

8.3 Methods

A prospective cohort study using historical control was performed.

8.3.1 Participants

All patients admitted to a private metropolitan rehabilitation unit in Australia over two, twenty-week periods (prospective cohort period = October 2016 to March 2017, historical control period = November 2015 to March 2016) were included in the study. The rehabilitation unit provides rehabilitation care to a mixed adult caseload including populations with neurological, orthopaedic and deconditioning diagnoses. The rehabilitation unit comprises 20 beds and provides a 6-day physiotherapy service. Participant demographic data including age, gender, primary diagnosis, discharge destination and acute hospital LOS were collected. Ethical approval for this study was granted by the University of Queensland Medical Research Ethics Committee and the UnitingCare Health Human Research Ethics Committee (Appendix 1). Individual participant consent to participate in this study was not required as the service provided in both the prospective and historical periods was deemed to be part of usual practice.

8.3.2 Intervention

The historical control group received usual care including 6-day physiotherapy-only services. Participants received therapy based on their specific need determined by their treating therapists which usually consisted of an average of one hour of physiotherapy and occupational therapy per weekday, and aimed to improve function to enable independent living in the community. Control group participants were eligible to receive physiotherapy intervention within a 3.5-hour physiotherapy service provided on Saturday, staffed by one physiotherapist and an assistant-in-nursing staff member providing porterage and some therapy assistance. The service involved a combination of group and individual therapy sessions, taking place in both the therapy gym or on the ward, and included documentation time. Participants eligibility criteria has been outlined in Chapter 4.

During the prospective period, the same weekday care was provided, with a multidisciplinary service offered on Saturday, consisting of four hours each of physiotherapy and occupational therapy, with an allied health assistant performing porterage and therapy assistant duties. The physiotherapy service and eligibility criteria did not change from that provided to the historical group. Participants were eligible to attend the Saturday occupational therapy service if admitted on a Friday, required an initial assessment to be completed (ADL, cognitive or neurological assessment), required compression therapy, were neurological patients that would benefit from weekend occupational therapy input, or required extra therapy input prior to discharge. A maximum of two ADL assessments could be scheduled each Saturday. Occupational therapy sessions consisted of group or individual

sessions and took place on the ward or therapy gym. Participants could receive both physiotherapy and occupational therapy services on the Saturday.

8.3.3 Outcome measures

LOS (number of nights spent in the rehabilitation unit from admission to discharge) was the primary outcome measure collected. Secondary outcomes included the FIM, and clinical measures of gait and balance. The FIM is a valid measure of functional independence, which has been validated across a variety of patient and clinician populations (Ottenbacher et al., 1996; Passalent et al., 2011). Total FIM scores, as well as scores for the motor and cognitive components of the FIM were collected. FIM change (the difference between admission and discharge FIM scores) and FIM efficiency (FIM change divided by LOS) were calculated. Clinical measures of gait and balance as per Chapter 4, were also collected. Service utilisation data for the Saturday service, including number of participants attending the service, average number and length of sessions attended was also collected by reviewing service statistics documented by the treating therapists.

Data used to evaluate implementation cost was collected from the hospital for the data collection periods. All wages are reported in Australian dollars. Total cost for rehabilitation was calculated by analysing ward expenses, and hospital overheads (Appendix 4). Allied health and nursing staffing costs were based on wage rates per hour (inclusive of weekend loading and on-costs) (Appendix 5).

8.3.4 Data analysis

Descriptive analyses were completed for all measures in both cohorts. To investigate differences in outcome measures (LOS, functional independence, gait and balance) or characteristics between all participants in the two cohorts, and for those receiving weekend therapy, independent t-tests, analysis of variance or Mann–Whitney U-tests were performed. Analyses of covariance were performed to compare outcome measures between cohorts to account for differences found in admission FIM total and cognitive FIM scores. Statistical analysis was completed using SPSS (version 23, Chicago, IL), with $p < 0.05$ used to indicate statistical significance.

To investigate the impact the intervention had on LOS, a Poisson regression model was constructed. A Poisson regression (Cameron & Trivedi, 2009) was specified because LOS was skewed and the null hypothesis that the residuals were normally distributed was rejected by Shapiro-Wilk test [W = 0.88 (*p*-value < 0.01)]. The structure of the model was as follows,

$$LOS = \alpha_{0+} \alpha_1 MD + \alpha_2 FimC + \alpha_3 FimM + \alpha_4 FimT + \alpha_5 A + \alpha_6 D + \alpha_7 fem + \alpha_8 age + \varepsilon i$$

The dependent variable LOS was a count of number of days in the rehabilitation unit. The explanatory variable of interest (*MD*) was a binary variable equal to one if the participant received the multidisciplinary 6-day service. Three measures of FIM taken on admission to the rehabilitation ward were included; (i) FIM cognition score (*FimC*) (range: 5-35), (ii) FIM motor score (*FimM*) (range: 13-91) and (iii) FIM total score (*FimT*) (range: 18-126), to control for any systematic differences in function between the control and intervention groups. Two sets of binary variables for day of admission (**A**) and day of discharge (**D**), were included

to control for possible temporal effects on LOS (Earnest, Chen, & Seow, 2006; Schmidt et al., 2003). Sundays were omitted from the model. Controls for sex (equal to 1 if female) and age (years) were also included and εi is a random error term. Date of admission was omitted, because no statistically significant difference between the historical control (2nd January 2016) and the prospective cohort (7th January 2017) was identified (see Figure 8-1). The null hypothesis; that 6-day intervention had no effect on LOS, (H_0: $\alpha_1 = 0$), is rejected if α_1 has a *p*-value < 0.05. Interpretation of the coefficient was derived by estimating the marginal effects. The Poisson regression coefficient was interpreted as follows: for a one-unit change in the predictor variable, the difference in the logs of expected counts was expected to change by the respective regression coefficient, given the other predictor variables in the model are held constant. Interpretation of the coefficient was derived by estimating the marginal effects.

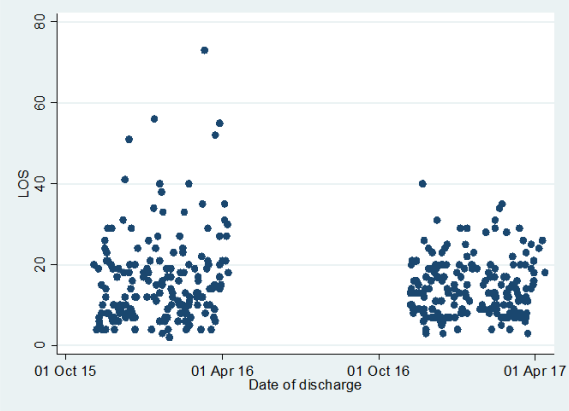

Figure 8-1: Comparison of length of stay in rehabilitation for the control and intervention periods.

A cost-minimisation approach was used to compare the costs to provide a multidisciplinary and physiotherapy-only 6-day rehabilitation service. A cost-minimisation analysis is the

recommended approach for economic evaluation when the consequences of two or more treatments or programs can be assumed to be equivalent (Drummond et al., 2015). While previous research has suggested weekend rehabilitation may improve the recipient's health related QOL, the reported results did not reach statistical significance (Brusco et al., 2014, 2015). Hence, the conservative assumption of equivalence (i.e. weekend rehabilitation has had no effect on the patient's health related QOL) is evoked, reducing the economic analysis to a cost-minimisation analysis.

8.4 Results

8.4.1 Participants

Over the two time periods, 366 patients were admitted to rehabilitation in this unit – 174 in the historical control group (receiving 6-day physiotherapy services) and 192 in the prospective cohort (receiving 6-day multidisciplinary services).

8.4.2 Saturday therapy allocation

A significantly greater proportion of participants in the multidisciplinary intervention group received 6-day therapy compared to the physiotherapy-only control group (83% compared to 72%, p=0.012) (Table 8-1). Over 95% of participants allocated to physiotherapy 6-day services attended Saturday sessions, and over 85% of participants allocated attended Saturday occupational therapy sessions. Participants receiving 6-day therapy in the prospective cohort received significantly more therapy on a Saturday, in terms of number of

therapy sessions attended (mean difference 0.7 sessions, 95%CI 0.40 to 0.99), and time spent in Saturday therapy (mean difference 71.7 minutes, 95%CI 52.37 to 90.97), compared to the control period (Table 8-1). Participants in the prospective cohort received a significantly greater total number of occasions of service on a Saturday compared to the control group (mean difference 7.1, 95%CI 5.50 to 8.80), which included a significant increase in physiotherapy occasions of service in the intervention group compared to the control group (mean difference 1.5, 95%CI 0.45 to 2.56) (Table 8-1). Participants attending occupational therapy services on a Saturday received an average of one assessment intervention (SD 0), lasting an average of 54.2 minutes (SD12.0), and 1.21 treatment sessions (SD 0.5) lasting an average of 59.6 minutes (SD 30.6). Interventions were provided in either group or one-to-one sessions in similar proportions (1.12 SD 0.3 vs 1.15 SD 0.5). Six participants received only occupational therapy intervention, 63 participants received only physiotherapy intervention and 91 participants received both physiotherapy and occupational therapy intervention over the weekend during their stay in rehabilitation in the prospective period.

8.4.3 Comparing historical control and prospective cohort

A comparison of demographic and service utilisation data for all participants in the historical and prospective cohorts is presented in Table 8-1. When comparing the two groups as a whole (control group n=174, prospective group n=192), there was no difference between groups in age, sex, diagnosis, acute hospital LOS or discharge destination. Participants in the prospective cohort had a reduction in rehabilitation LOS by 2.4 days compared to the

Table 8-1: Comparison of demographic data for all participants in historical and prospective cohorts

Variable	Historical control n=174	Prospective cohort n=192	p-value
Age, mean (SD)	77.7 (12.92)	78.8 (10.57)	p = 0.347
Sex, female, n (%)	110 (63.2%)	130 (67.7%)	p = 0.367
Admitting diagnosis, n (%)			p = 0.124
Stroke	7 (4%)	4 (2.1%)	
Neurology	28 (16.1%)	16 (8.3%)	
Amputee	5 (2.9%)	-	
Musculoskeletal	6 (3.4%)	11 (5.7%)	
Orthopaedic – trauma	30 (17.2%)	40 (20.8%)	
Orthopaedic – elective	35 (20.1%)	47 (24.5%)	
Reconditioning	63 (36.2%)	74 (38.5%)	
Acute LOS*, mean (SD)	11.8 (12.24)	11.1 (8.51)	p = 0.459
Discharge destination, n (%)			p = 0.473
Home	140 (80.5%)	163 (84.9%)	
Low level care	3 (1.7%)	2 (1%)	
High level care	16 (9.2%)	14 (7.3%)	
TCP or another hospital ward	10 (5.7%)	11 (5.7%)	
Admission FIM, mean (SD)			
Total (score/126)	82.9 (21.61)	88.0 (17.43)	p = 0.078
Motor (score/91)	53.9 (17.42)	57.1 (14.73)	p = 0.148
Cognitive (score/35)	29.0 (6.47)	31.2 (4.91)	p = 0.007
Number of participants attending Saturday therapy, n (%)	126 (72%)	160 (83%)	p = 0.012
Average Saturday sessions attended, mean (SD)			
Total	1.6 (1.1)	2.3 (1.4)	p < 0.001
Physiotherapy	1.6 (1.1)	1.6 (1.0)	p = 0.88
Occupational therapy	-	1.2 (0.6)	-
Average time spent in Saturday therapy, mins, mean (SD)			
Total	85 (53)	157 (99)	p < 0.001
Physiotherapy	87 (52)	86 (47)	p = 0.879
Occupational therapy	-	64 (30)	-
Average occasions of service provided on a Saturday			
Total	10.4 (1.2)	17.5 (3.2)	p < 0.001
Physiotherapy	10.6 (1.1)	12.1 (1.9)	p = 0.006
Occupational therapy	-	6.0 (1.8)	-

*Acute LOS = LOS in acute wards prior to transferring to rehabilitation ward
FIM = Functional Independence Measure, LOS = length of stay, mins = minutes, n = number, SD = standard deviation, TCP = Transition Care Program.

control group (95%CI 0.47 to 4.25) (Figure 8-1). Participants in the physiotherapy-only group had a significantly greater FIM change compared to the prospective cohort (mean difference = 3.9, p=0.002) (Table 8-2). There was no difference between groups in total or motor FIM scores on admission or discharge, however participants in the control group had lower cognitive FIM scores on admission and discharge compared to participants in the prospective cohort. When admission total and cognitive FIM scores were included as covariates, there was no significant difference in LOS between the two groups ($F = 1.371$, $p = 0.255$ and $F = 1.559$, $p = 0.212$).

When investigating gait and balance measures, there were significant differences between groups on admission and discharge for FR and BOOMER, with the control group performing worse on these measures ($p < 0.019$) (Table 8-2). There were no differences between groups for other measures of gait and balance on admission, discharge or change scores. When admission total FIM was controlled as a covariate, significantly greater changes in TUG (mean difference 8.69s, $p = 0.040$) were found in the prospective cohort compared to the control group.

8.4.4 Comparing participants receiving 6-day physiotherapy-only and multidisciplinary therapy

Comparing only those participants receiving 6-day therapy in the prospective (n=160) and control (n=126) groups, there was no difference between groups in age, diagnosis, acute hospital LOS or discharge destination (Table 8-3). There were significantly more females in

Table 8-2: Mean (SD) outcome measures for all participants for historical control and prospective cohort at admission and discharge, mean (SD) within group differences (discharge minus admission) and mean (95% confidence interval (CI)) differences between prospective and control periods.

Outcomes	Historical control		Prospective cohort		Historical control DC - ADM	Prospective cohort DC - ADM	Prospective cohort – historical control Mean Difference (95% CI)
	ADM	DC	ADM	DC			
LOS, days	-	16.3 (11.13)	-	14.0 (6.99)	-	-	-2.4 (-4.25 to -0.47)
FIM							
Total (score/126)	82.9 (21.61)	108.6 (16.84)	88.0 (17.43)	109.9 (15.71)	25.7 (12.58)	21.9 (10.72)	-3.9 (-6.29 to -1.44)
Motor (score/91)	53.9 (17.42)	77.5 (13.24)	57.1 (14.73)	77.7 (13.27)	23.6 (11.07)	20.6 (9.97)	-3.0 (-5.17 to -0.80)
Cognition (score/35)	29.0 (6.47)	31.1 (4.88)	31.2 (4.91)	32.2 (4.10)	2.0 (3.18)	1.0 (2.06)	-1.1 (-1.63 to -0.53)
FIM efficiency (FIM difference/LOS)	-	2.0 (1.19)	-	1.8 (1.08)	-	-	-0.2 (-0.38 to 0.09)
TUG (s)	30.2 (27.35)	26.2 (28.74)	37.0 (28.26)	23.9 (16.28)	6.9 (12.82)	15.6 (21.56)	8.7 (2.87 to 14.50)
10MWT (m/s)	0.6 (0.27)	0.7 (0.33)	0.6 (0.34)	0.8 (0.33)	-0.2 (0.22)	-0.2 (0.25)	0.0 (-0.07 to 0.09)
FR (cm)	6.3 (9.24)	13.8 (13.07)	11.8 (10.84)	18.1 (10.21)	-6.4 (9.98)	-5.3 (8.01)	1.0 (-3.98 to 1.96)
Step Test (avg n)	2.4 (3.80)	6.4 (5.37)	2.8 (4.18)	5.9 (5.00)	-3.2 (3.92)	-3.0 (3.59)	0.2 (-1.21 to 0.89)
FTEC (s)	11.0 (13.09)	19.6 (13.55)	14.1 (14.07)	22.6 (11.79)	-7.8 (12.82)	-7.7 (12.26)	0.0 (-3.66 to 3.58)
BOOMER (score/16)	3 (4.42)	6 (5.57)	5 (4.38)	9 (4.21)	-2.4 (3.71)	-3.0 (2.76)	0.6 (-0.57 to 1.73)

ADM = admission, avg = average, BOOMER = Balance Outcome Measure for Elder Rehabilitation, cm = centimetres, DC = discharge, FIM = Functional Independence Measure, FR = Functional Reach, FTEC = Feet Together Eyes Closed, LOS = length of stay, m/s = meters per second, s = seconds, SD = standard deviation, TUG = Timed Up and Go Test, 10MWT = 10 Meter Walk Test.

Table 8-3: Comparison of demographic data for participants receiving weekend therapy

Variable	Historical control (n=126)	Prospective cohort (n=160)	Significance
Age, mean (SD)	77.5 (13.28)	79.4 (10.79)	p = 0.125
Sex, Female, n (%)	75 (59.5%)	110 (68.8%)	p = 0.011
Admitting diagnosis, n (%)			p = 0.111
Stroke	6 (4.8%)	4 (2.5%)	
Neurology	23 (18.3%)	14 (8.8%)	
Amputee	5 (4%)	-	
Musculoskeletal	2 (1.6%)	10 (6.3%)	
Orthopaedic – trauma	24 (19%)	37 (23.1%)	
Orthopaedic – elective	25 (19.8%)	38 (23.8%)	
Reconditioning	41 (32.5%)	57 (35.6%)	
Acute LOS*, mean (SD)	11.5 (13.17)	11.0 (8.21)	p = 0.685
Discharge destination, n (%)			p = 0.280
Home	98 (77.8%)	134 (83.8%)	
Low level care	3 (2.4%)	2 (1.3%)	
High level care	14 (11.1%)	12 (7.5%)	
TCP or another hospital ward	9 (7.1%)	10 (6.3%)	
Admission FIM, mean (SD)			
Total (score/126)	80.5 (21.27)	85.8 (17.208)	p = 0.020
Motor (score/91)	51.6 (16.88)	55.1 (14.552)	p = 0.063
Cognitive (score/35)	28.9 (6.59)	31.0 (4.966)	p = 0.002
Average Saturday sessions attended, mean (SD)			
Total	1.6 (1.11)	2.3 (1.38)	p < 0.001
Physiotherapy	1.6 (1.11)	1.6 (0.97)	p = 0.88
Occupational therapy	-	1.2 (0.59)	-
Average time spent in Saturday therapy, mins, mean (SD)			
Total	85.4 (53.14)	157.0 (99.28)	p < 0.001
Physiotherapy	87.4 (52.06)	86.0 (47.11)	p = 0.879
Occupational therapy	-	64.2 (30.35)	-
Average occasions of service provided on a Saturday			
Total	10.4 (1.2)	17.5 (3.2)	p < 0.001
Physiotherapy	10.6 (1.1)	12.1 (1.9)	p= 0.006
Occupational therapy	-	6.0 (1.8)	-

*Acute LOS = LOS in acute wards prior to transferring to rehabilitation ward
FIM = Functional Independence Measure, LOS = length of stay, mins = minutes, n = number, SD = standard deviation, TCP = Transition Care Program

Table 8-4: Mean (SD) outcome measures for participants receiving 6-day therapy for historical control and prospective cohort at admission and discharge, mean (SD) within group differences (discharge minus admission) and mean (95% confidence interval (CI)) differences between prospective and control periods.

Outcomes	Historical control		Prospective cohort		Historical control DC - ADM	Prospective cohort DC - ADM	Prospective cohort – historical control Mean Difference (95% CI)
	ADM	DC	ADM	DC			
LOS, days	-	18.4 (11.4)	-	14.9 (6.9)	-	-	-3.5 (-5.64 to -1.33)
FIM							
Total (score/126)	80.5 (21.3)	108.1 (16.5)	85.8 (17.2)	108.9 (10.2)	27.7 (12.8)	23.0 (11.0)	-4.7 (-7.46 to -1.87)
Motor (score/91)	51.6 (16.9)	76.9 (12.9)	55.1 (14.6)	76.8 (13.7)	25.4 (11.2)	21.7 (10.2)	3.7 (-6.16 to 1.15)
Cognition (score/35)	28.9 (6.6)	31.2 (4.8)	31.0 (5.0)	32.0 (4.2)	2.3 (3.4)	1.0 (2.1)	-1.3 (-1.91 to -0.62)
FIM efficiency	-	1.8 (1.0)	-	1.8 (1.0)	-	-	-0.1 (-0.12 to 0.29)
TUG (s)	32.0 (28.6)	26.7 (29.7)	40.1 (29.8)	25.0 (16.9)	-8.3 (14.7)	-17.2 (22.6)	-8.9 (-16.28 to -1.50)
10MWT (m/s)	0.6 (0.2)	0.7 (0.3)	0.60 (0.3)	0.8 (0.3)	0.2 (0.2)	0.2 (0.2)	-0.0 (-0.11 to 0.07)
FR (cm)	5.2 (8.7)	14.2 (13.7)	10.4 (10.5)	16.8 (10.0)	7.7 (11.2)	5.3 (8.2)	-2.5 (-6.06 to 1.16)
Step Test (avg n)	2.0 (3.4)	6.2 (5.2)	2.3 (3.8)	5.4 (4.7)	3.3 (4.0)	3.1 (3.7)	-0.2 (-1.43 to 0.96)
FTEC (s)	9.2 (12.4)	19.5 (13.5)	13.2 (14.1)	22.3 (12.0)	9.2 (13.1)	8.1 (12.3)	-1.1 (-5.18 to 3.07)
BOOMER (score/16)	2 (3.6)	6 (5.5)	5 (4.2)	9 (4.3)	3 (4.2)	3 (2.8)	0.0 (-1.38 to 1.42)

ADM = admission, avg = average, BOOMER = Balance Outcome Measure for Elder Rehabilitation, cm = centimetres, DC = discharge, FIM = Functional Independence Measure, FR = Functional Reach, FTEC = Feet Together Eyes Closed, LOS = length of stay, m/s = meters per second, s = seconds, SD = standard deviation, TUG = Timed Up and Go Test, 10MWT = 10 Meter Walk Test.

the intervention group compared to those in the control group (p = 0.011) (Table 8-3). Participants in the prospective cohort had a significantly shorter rehabilitation LOS compared to the control group by 3.5 days (p = 0.002) (Table 8-4). Participants in the control group had significantly lower total and cognitive FIM scores on admission, compared to those in the prospective cohort (p < 0.020) (Table 8-3). There was no difference in discharge FIM scores or FIM efficiency between groups, however the control group had a significantly greater total and cognitive FIM change compared to the prospective cohort (p < 0.001) (Table 8-4).

The significant reduction in rehabilitation LOS in the intervention group remained when admission total and cognitive FIM were included as covariates (F = 3.466, p = 0.033; F = 3.873, p = 0.022). Discharge motor FIM score was found to be significantly different with admission FIM controlled for as a covariate (F = 7.422, p = 0.007). Motor FIM difference was found to be significantly different between groups with admission cognitive FIM score accounted for as a covariate (F = 6.146, p = 0.014).

Differences were found for some of the gait and balance measures between the two groups. Significant between group differences were found on admission for FR, FTEC and BOOMER, with the control group performing worse (p<0.001) (Table 8-4). On discharge, there was a significant difference between groups in BOOMER scores, with the control group performing worse (p=0.008). A significantly greater change in TUG was found in the prospective cohort compared to the control group (Table 8-4). There were no other differences in gait and balance measures between groups.

Table 8-5: Poisson regression, marginal effects and interactions for the impact the intervention has on LOS

	Model 1		Marginal Effects		Model 2	
LOS in rehabilitation	Coef.	p-value	Coef.	p-value	Coef.	p-value
Intervention group (0/1)	-0.10	0.05	-1.46	0.06	n.a.	n.a.
Female (0/1)	-0.03	0.66	-0.37	0.66	0.001	0.98
Age (years)	-0.01	0.05	-0.09	0.05	-0.01	0.05
FIM on admission	-0.02	<0.01	-0.33	<0.01	-0.03	< 0.01
FIM_cognition score (O.A.)	0.02	0.01	0.31	0.01	0.03	< 0.01
FIM_motor score (O.A.)	0.00	0.57	0.07	0.57	0.01	0.33
Discharged on Mon (0/1)	-0.25	0.10	-3.30	0.07	-0.21	0.18
Discharged on Tue (0/1)	-0.25	0.08	-3.36	0.06	-0.22	0.16
Discharged on Wed (0/1)	-0.28	0.06	-3.69	0.04	-0.20	0.17
Discharged on Thu (0/1)	-0.38	0.01	-4.87	<0.01	-0.33	0.03
Discharged on Fri (0/1)	-0.49	0.00	-6.09	0.00	-0.46	0.01
Discharged on Sat (0/1)	-0.14	0.56	-1.84	0.53	-0.10	0.66
Admitted on Mon (0/1)	0.21	0.02	3.16	0.02	0.21	0.02
Admitted on Tue (0/1)	0.10	0.29	1.50	0.30	0.07	0.46
Admitted on Wed (0/1)	0.07	0.42	1.06	0.43	0.06	0.47
Admitted on Thu (0/1)	0.10	0.46	1.56	0.48	0.10	0.50
Admitted on Fri (0/1)	0.002	0.99	0.03	0.99	0.09	0.74
Admitted on Sat (0/1)	0.04	0.70	0.53	0.70	0.05	0.56
Diagnosis						
Neurology (0/1)	n.a.	n.a.	n.a.	n.a.	-0.15	0.34
Musculoskeletal (0/1)	n.a.	n.a.	n.a.	n.a.	-0.45	0.14
Orthopaedic-trauma (0/1)	n.a.	n.a.	n.a.	n.a.	-0.19	0.27
Orthopaedic-elective (0/1)	n.a.	n.a.	n.a.	n.a.	-0.39	0.01
Reconditioning (0/1)	n.a.	n.a.	n.a.	n.a.	-0.41	< 0.01
Interaction (*Diagnosis x Intervention*)						
Stroke * Rx (0/1)	n.a.	n.a.	n.a.	n.a.	-0.11	0.49
Neurology * Rx (0/1)	n.a.	n.a.	n.a.	n.a.	-0.32	0.06
Musculoskeletal * Rx (0/1)	n.a.	n.a.	n.a.	n.a.	-0.06	0.84
Orthopaedic-trauma * Rx (0/1)	n.a.	n.a.	n.a.	n.a.	-0.15	0.22
Orthopaedic-elective * Rx (0/1)	n.a.	n.a.	n.a.	n.a.	-0.12	0.21
Reconditioning * Rx (0/1)	n.a.	n.a.	n.a.	n.a.	0.04	0.56
Constant	4.58	< 0.01	n.a.	n.a.	4.59	< 0.01

Note: The diagnosis stroke (0/1) omitted from Model 2
Coef. = coefficient, FIM = Functional Independence Measure, LOS = length of stay, O.A. = on admission, n.a. = not applicable, Rx = treatment

Table 8-5 demonstrates the Poisson regression investigating the impact of the intervention on LOS. Model 1 reports coefficients with *p*-values obtained from the estimation of equation 1 with

robust standard errors. The intervention (multidisciplinary weekend therapy) was negatively correlated with LOS, however the *p*-value (0.065) was marginally beyond the conventional threshold of statistical significance (0.05). The marginal effect on LOS was estimated to be a reduction of 1.5 days. Model 2 includes a set of dichotomous variables for diagnoses (neurology, musculoskeletal, orthopaedic-trauma, orthopaedic-elective & reconditioning) and their interactions with the intervention. The interaction term, *Neuro * Rx*, showed a trend that patients with a neurological deficit benefited most from the intervention (p = 0.06). The marginal effect was a reduction in LOS of 4.4 days.

The results from quantile regressions reported in Table 8-6, suggest that those patients with the longest LOS benefited most from the intervention.

Table 8-6: Quantile regressions - impact of intervention on length of stay.

Quantile	Intervention Group (0/1)	*p*-value
.1	0.06	0.64
0.25	0.01	0.86
0.5	-0.02	0.71
0.75	-0.11	0.08
0.9	-0.11	0.53
0.95	-0.14	0.32
0.96	-0.17	0.63
0.97	-0.18	0.34
0.98	-0.24	0.01
0.99	-0.24	< 0.01

8.4.5 Economic analysis

The costs of providing 20 weeks of rehabilitation to the control and prospective cohorts are summarised in Table 8-7, (see Appendix 4 and 5 for further details). The prospective intervention

was estimated to reduce the average LOS by 1.46 days, which implies a total of 280 bed-days saved for the prospective cohort (i.e. 1.46 days x 192 participants admitted during the prospective period). At an estimated cost of AUD$1,039 SD 305 per rehabilitation bed-day in Queensland (IHPA, 2015), this equals a total savings of approximately AUD$281,000 (i.e. 280 bed-days saved x $1,039 per bed-day) (Table 8-7). Set against these savings, are the net costs of funding the intervention. Monte Carlo simulation (1,000 replications) indicates a 96% probability that the intervention was cost saving.

Table 8-7: Economic evaluation comparing the costs (in AUD$) of the historical control and prospective cohort groups with the savings found due to the average reduction in length of stay in the prospective cohort.

Parameters	
Patients in intervention group	192
Average reduction in LOS, days mean (SD)	1.46 (0.77)
Total reduction in LOS, days	280.3
Cost per bed-day, mean (SD)	$1,039 ($305)
Total savings (cost per bed-day x total reduction in LOS)	$291,252
Costs	
Saturday rehabilitation for the prospective cohort	$22,007
Saturday rehabilitation for the historical control	$12,137
Net Cost (prospective cohort – historical control)	$ 9,870
Net Value (= total savings – net cost)	$281,382

LOS = length of stay, SD = standard deviation

8.5 Discussion

This study investigated the effectiveness of a multidisciplinary 6-day rehabilitation service on LOS, functional independence, gait and balance outcomes and implementation costs compared to a physiotherapy-only 6-day service. A significantly greater number of participants were allocated to weekend therapy in the multidisciplinary prospective cohort, and participants received more therapy on a weekend on average compared to those in the historical control. Participants in the

prospective cohort had a significantly reduced LOS in rehabilitation by up to 2.4 days compared to the historical control when all participants were compared, regardless of whether they were allocated extra weekend therapy. However, participants in the historical control had a lower FIM score on admission, and a greater FIM change between admission and discharge from rehabilitation. Despite this, the reduction in rehabilitation LOS remained as a trend for prospective cohort participants receiving 6-day therapy when controlling for admission total and cognitive FIM scores, finding a reduction in LOS by 1.5 days. Gait and balance measures were different on admission and discharge, with the historical control performing worse on these. A cost-minimisation analysis revealed providing the multidisciplinary service resulted in cost savings for the hospital of just over $280,000.

This finding is the first effectiveness study to find a statistically significant reduction in LOS with weekend therapy service intervention in mixed rehabilitation settings. A significant reduction in LOS of 2.4 days was found when all participants were included in the analysis, a significant reduction of 3.5 days was found comparing only participants receiving 6-day therapy, and trend towards a reduction in LOS by 1.5 days was found when admission independence was included as a covariate. Previous RCTs have found reductions of up to 3.2 days in mixed rehabilitation settings (Brusco et al., 2007; Peiris, Shields, et al., 2013), however these findings have not been statistically significant. These previous RCTs included both physiotherapy-only (Brusco et al., 2007), and multidisciplinary service provision (Peiris, Shields, et al., 2013) similar to the current study. One notable difference is that this current study compared two models of 6-day service provision, whereas the RCTs compared 5- and 6-day service provision. The current study appears to have a shorter average LOS in both the intervention and control groups compared to the previous RCTs, with a smaller standard deviation, which may explain the results found in this study. The

reduction in LOS in the current study, and previous studies, may have far reaching effects, not just for patient outcomes and health service costs (as will be discussed further below), but also in terms of improved flow of patients through both the rehabilitation unit and wider hospital. There was a concomitant increase in throughput in the rehabilitation unit with this reduction in LOS in the multidisciplinary group, with approximately 10% more participants able to be admitted to rehabilitation during the prospective cohort (192 participants) compared to the historical control (174 participants). This may lead to an improved flow of patients through the hospital and possibly reduced rehabilitation waiting lists.

It is not clear what contributed to the reductions in LOS found in the current study. As RCT methodology was not used, the reductions cannot necessarily be attributed simply to the provision of the multidisciplinary service. The only change implemented to the 6-day service was the addition of occupational therapy and an allied health assistant. The addition of occupational therapy to this Saturday service resulted in on average one assessment and one treatment session for each patient during their admission. In people with stroke completing rehabilitation in Canada, a one-point improvement in FIM score is associated with every 45 minutes spent in occupational therapy (Foley et al., 2012). However, it would seem unlikely that this alone would have contributed to the significant reduction in LOS. It may also be that the physiotherapy service, which has evolved over a number of years, has now become more efficient, and better at identifying who is likely to benefit from weekend service provision. The number of patients allocated to this service has grown in time from 60% in the initial implementation of a physiotherapy-only service (Chapter 4) to 72% with rehabilitation physiotherapy staffing of the Saturday service (Chapter 5) to 83% in this study. This increase in patients allocated to the weekend service was not just seen in occupational therapy, but also in physiotherapy, with the

average occasions of service increasing in the current study compared to the physiotherapy-only service. Further research is required to clarify the efficacy of a multidisciplinary weekend service compared to a physiotherapy only weekend service and whether the results found in this study are due to a multidisciplinary effect, or the increased efficiency of a service in place for several years.

The current study found cost saving to the hospital with multidisciplinary compared to physiotherapy-only 6-day service provision. The enumeration of costs included estimates for fixed costs (hospital overheads & ward expenses) and variable costs (allied healthcare wages). Wages were the largest cost component (approximately 90%), and accounted for weekend, casual and employee on-costs. While the analysis did not include estimates for equipment depreciation and allocated floor space, these costs categories are minor in comparable economic analyses (Brusco et al., 2014), and therefore the cost estimates are reasonably robust. However, the economic analysis was sensitive to the effects estimate. While the costs in the current study were only investigated for the rehabilitation admission of each patient included in the investigated time periods, this finding adds to previous economic analyses (Brusco et al., 2014, 2015). The results of the current study illustrate that the addition of a multidisciplinary weekend rehabilitation service leads to cost savings to the hospital. Previous cost-effectiveness analyses completed along-side a multidisciplinary weekend service intervention comparing health care costs at 30 days (Brusco et al., 2014) and 12 months post discharge from rehabilitation (Brusco et al., 2015), have found that the service is likely cost effective at both time points, and have reported cost savings per quality-adjusted life year gained and for achieving a minimally clinically important difference in functional independence. The result of the current study, coupled with the results of the previous economic analyses (Brusco et al., 2014, 2015) illustrate that weekend service interventions lead to

reductions to hospital costs, are likely cost effective and do not transfer these costs to local health care providers after discharge (Brusco et al., 2014, 2015). The combined economic benefit gained from the implementation of a multidisciplinary weekend service thus appears to have far reaching effects, and long-term benefits not just to patients but also to health services.

Participants receiving multidisciplinary weekend service provision spent more time in therapy on a weekend compared to those in the physiotherapy only group. More therapy leads to better patient outcomes in terms of QOL and improved walking activity in subacute populations (Peiris et al., 2011). However, the amount of extra therapy patients need to receive to gain these benefits varies in the literature. Peiris and colleagues (2011) reported an extra 19 minutes of physiotherapy per day for patients with acute or subacute conditions could achieve these results (Peiris et al., 2011), while a recent systematic review reported people with stroke required an extra 240% of rehabilitation therapy per day to improve activity capacity (Schneider et al., 2016). Participants in the intervention group received an average of 157 minutes of multidisciplinary therapy on a Saturday, and completed an average of 2.31 sessions over the course of their rehabilitation stay. While this is not 240% extra therapy or 19 minutes extra physiotherapy per day, the real world implementation of a multidisciplinary rehabilitation weekend service used in the current study appears to have been beneficial in improving LOS and leading to cost savings for the hospital. It may be that any intervention to increase therapy time, provided that it is cost effective, warrants further investigation to determine whether this is an avenue worth exploring in order to address the growing need for efficiency in rehabilitation due to the growing ageing population.

The provision of a multidisciplinary weekend rehabilitation service better fits the Standards for the Provision of Inpatient Adult Rehabilitation Medicine Services in Public and Private Hospitals (Australasian Faculty of Rehabilitation Medicine, 2011) stating that multidisciplinary therapy should be provided on a minimum of five days per week, however, it does not match the Guidelines for Recognition of Private Hospital Based Rehabilitation Services (Consultative Committee on Private Rehabilitation, 2016). These guidelines state that specialist rehabilitation services should be provided seven days per week (Consultative Committee on Private Rehabilitation, 2016). Despite this, the evidence for providing 7-day rehabilitation therapy has been explored in Chapter 2, and 6-day service provision (at least in stroke populations) appears to result in better patient outcomes (English et al., 2016). Chapter 7 of this thesis found that the majority of facilities providing weekend rehabilitation services in Australia provided a half day Saturday service, staffed with physiotherapists. Despite clinician support for multidisciplinary staffing (Chapter 7), less than 20% of facilities in Australia provided a multidisciplinary weekend service for rehabilitation (Chapter 7). Interestingly, until this current study, greater reductions in LOS have been found with facilities providing physiotherapy weekend service (Brusco et al., 2007; English et al., 2015; Chapters 4 and 5) compared to those providing multidisciplinary weekend services (DiSotto-Monastero et al., 2012; Hakkennes et al., 2015; Peiris, Shields, et al., 2013; Ruff et al., 1999). As this has been one of the few studies investigating weekend therapy to find a significant difference in LOS, it may be that this service provision model warrants further pragmatic investigation to see if these results are reproducible in a variety of different service models and settings.

Interestingly, the quantile regression analysis found that participants who had the longest LOS gained the most benefit from weekend service provision, in terms of reducing LOS. This may be

because more Saturday therapy sessions are available to these patients simply due to being in hospital for longer. Additionally, it is likely that these patients were those with lower functional levels and therefore were identified as requiring increased therapy input to help achieve functional gains. It is also likely that these patients were admitted with a stroke or orthopaedic fracture diagnosis as these populations tend to have longer LOS (Granger et al., 2009; Granger et al., 2010a; Granger et al., 2011). Due to this finding, it may beneficial to allocate these populations to weekend therapy as they appear to gain a greater reduction in LOS with weekend therapy services.

8.5.1 Limitations

This study has several limitations. First, participants, and treating and assessing therapists were not blinded to the allocation of participants to the 6-day service. There were also no independent assessors to determine participant eligibility to be allocated to the 6-day service or conduct admission and discharge assessments. This had the potential to bias results, however as measures were collected for all participants as part of usual care, and therapists were not specifically invested in only the participants attending weekend therapy showing a change and not other participants, this is unlikely to have impacted. Secondly, the Poisson regression reports a negative association between the intervention LOS (1.5 days), conditional upon disability and days of admission. The level of statistical significance was marginally beyond the pre-stated threshold. However, causal interferences should be drawn cautiously, because the model may not have controlled for all systematic differences between the two groups. To obtain a precise estimate of effect, an RCT would be required. Due to the small number of participants in this study, it is possible that this study was not powered for change in all outcome measures, and therefore the findings should be interpreted with caution. This data collection timeframe was chosen to match

with the other studies in this thesis, which were originally powered for LOS change. When investigating the fidelity of the 6-day service, there was a small amount of missing data regarding the attendance of allocated participants to the Saturday service (one week in the control group and three weeks in the prospective cohort). However, as the attendance of participants to the Saturday service is quite similar for physiotherapy in both groups, and relatively similar for occupational therapy, it seems unlikely that this missing data would have impacted the final result. This study took place at one location, which may limit the generalisability of results to other facilities of different size, population, therapist numbers and expertise. In terms of the economic analysis, a major limitation was that this study only investigated hospital costs, and not cost to the community or quality-adjusted life years. While it is important to be aware of the economic impact on the hospital providing the weekend therapy service, providing insight into the wider health service, and how this impacts on patients in the long term may be of more benefit.

8.6 Conclusion

The provision of multidisciplinary services (physiotherapy and occupational therapy) leads to a greater reduction in LOS compared a to a 6-day physiotherapy service, even when controlling for discrepancies in admission function. More participants attended weekend therapy and received a greater amount of therapy on a Saturday. The provision of a multidisciplinary 6-day service appears to be cost effective, leading to a reduction in costs to the hospital over a 20 week period by over $280,000.

Chapter 9 – Summary of findings and discussion

9.1 Summary of findings

This thesis aimed to investigate the pragmatic implementation of a weekend rehabilitation service. This has been achieved through a pilot and five studies. This chapter will summarise the findings of these studies, discuss the implications of these findings and identify areas for future research. Recommendations for clinical practice will be made, and strengths and limitations of this thesis will be addressed.

9.1.1 Chapter 3 – Pilot Study – Weekend therapy service provision in a sample of rehabilitation facilities throughout Australia

The first step of this thesis was to investigate weekend service provision in a purposive sample of major metropolitan and regional Australian rehabilitation facilities to determine the feasibility of implementing a weekend service at the target facility and to inform service design. Limited research had been completed into weekend service provision rates in rehabilitation, with no information found on how these services were provided or who received the services A purposive sample of 36 Australian rehabilitation units were surveyed investigating weekend service provision, service models, and whether service evaluation had been completed to determine the feasibility of implementing a weekend service at the target facility, as well as informing the design of this service.

Surveys were returned by 24 facilities (67% response rate). Sixty-three percent of facilities provided a weekend service in rehabilitation, the majority of which were private, metropolitan facilities treating mixed populations, providing a Saturday service, which implied that implementing a 6-day service at the target facility was feasible. Weekend therapy was most commonly provided by physiotherapists and assistants, with a small number of facilities providing

a multidisciplinary service. A variety of rostering systems were used to staff weekend services, and these were specific to individual facilities. Prior research or benchmarking, and service evaluation was not routinely carried out among the facilities surveyed, however facilities evaluating their service used LOS or patient/staff satisfaction data. This information determined that a 6-day service staffed with physiotherapists is the most suitable service model to implement at the target facility.

9.1.2 Chapter 4 – Study 1 – A pragmatic implementation of a 6-day physiotherapy service in a mixed inpatient rehabilitation unit

Previous studies had provided evidence of the efficacy of weekend therapy in rehabilitation, but only one RCT had investigated 6-day physiotherapy service provision in rehabilitation. No studies had investigated the implementation of this model of service under real world conditions. Therefore, a pragmatic implementation, whereby the service was staffed within the limitations of the departmental budget and patient eligibility criteria were used, of weekend service provision in rehabilitation was required. A private, metropolitan rehabilitation unit with a mixed caseload implemented a weekend service, modelled on service provision details reported in the pilot survey (Chapter 3), and co-designed with staff members from the pre-implementation survey of a formative evaluation (Chapter 6). A half-day Saturday service, staffed with a physiotherapist and assistant-in-nursing staff member, acting as porter and therapy assistant, was provided. This study aimed to determine the effectiveness of a 6-day physiotherapy service in a rehabilitation unit for eligible patients on LOS, functional independence and measures of gait and balance, when compared to a 5-day service. Participants needed to meet specific criteria to be eligible for the service including those who would deteriorate if not seen over the weekend, admitted to the rehabilitation unit on a Thursday or Friday, admitted for a rehabilitation stay of less than one

week, or were making functional gains and would benefit from additional physiotherapy input over the weekend.

Chapter 4 compared a historical control (n=266) receiving usual 5-day care with a prospective cohort (n=270) receiving usual care with an additional half day of physiotherapy (6-day physiotherapy). Sixty percent (n=162) of participants in the prospective cohort received 6-day physiotherapy. A comparison of the two groups showed no significant difference in LOS, functional independence and physiotherapy gait and balance measures. While not significant, there was a reduction in LOS by 1.7 days, which may have clinical and cost-saving implications for the hospital. In the prospective cohort, participants allocated to the 6-day physiotherapy group showed trend towards a reduction in LOS of two days. However, they demonstrated significantly greater FIM change and improvements in gait and balance measures compared to those receiving 5-day physiotherapy.

9.1.3 Chapter 5 – Study 2 – The impact of staffing model in a 6-day rehabilitation physiotherapy service

In Chapter 4 the staff providing the 6-day service were physiotherapists usually working in the acute wards, that did not necessarily have recent experience or expertise in rehabilitation. Following staff feedback (post-modification survey in Chapter 6), the service was changed to be provided by staff members currently working in rehabilitation. Utilising the same methods as in Chapter 4, Chapter 5 investigated the effectiveness of staffing currency of practice on weekend therapy service provision, LOS, functional independence and physiotherapy gait and balance measures. Chapter 5 also investigated the effectiveness of weekend physiotherapy service provision in different diagnostic groups.

Chapter 5 compared a historical control (n=270) receiving usual care with the Saturday physiotherapy service staffed with acute physiotherapists, with a prospective cohort (n=234) receiving Saturday physiotherapy service staffed with rehabilitation physiotherapists. Participants receiving 6-day physiotherapy by staff currently working in rehabilitation showed a trend towards a reduction in LOS by 1.5 days and greater improvements in functional independence, compared to acute staffing. Rehabilitation staffing also appeared to be more efficient, with more participants attending Saturday therapy and spending longer in Saturday therapy, compared to acute staffing. However, these benefits differed by diagnostic group. Participants with a neurological or reconditioning diagnosis had a reduction in LOS by four days, which although was not statistically different, is likely clinically significant. Orthopaedic populations demonstrated greater functional improvements, while patients with a neurological or orthopaedic diagnosis demonstrated greater FIM efficiency scores.

9.1.4 Chapter 6 – Study 3 – Implementing a 6-day physiotherapy service in rehabilitation – exploring staff perceptions

When implementing new services, it is important to gain staff feedback. Surveying staff regarding the barriers and facilitators prior to the implementation of a new service can lead to increased staff support and acceptability of the new service, and ensure the service is more appropriate, efficient and effective. Following implementation of a service, staff feedback should be gained on service adoption, how the service is running, and whether any improvements could be made to the service. Chapter 6 in this thesis was a formative evaluation of the implementation of 6-day rehabilitation service conducted alongside Chapters 4 and 5. Staff perspectives were investigated at three time points – before and after implementation, and following modification of the 6-day

physiotherapy service to be staffed by therapists working in rehabilitation, to determine barriers and facilitators to providing the service, and the perceived impact of weekend service provision on LOS and rates of goal attainment.

Fifty-one staff responded to the surveys (response rate 50%) over the three time points. Prior to implementation of the service, staff had opinions on how the service should be run in terms of location, type of therapy sessions, and number of patients treated per session. A large number of barriers to providing a 6-day service were identified, mainly related to staffing of the service. After implementation, the number of barriers reduced, and instead suggestions for improving the service were reported. Initially staff were unsure whether the service would impact LOS or goal attainment, however, post implementation and modification of the service, respondents felt that LOS was reduced, and goal attainment was faster.

9.1.5 Chapter 7 – Study 4 – Allied health weekend service provision in Australian rehabilitation units

Pilot study findings in Chapter 3 indicated that a comprehensive survey was necessary to quantify national weekend therapy provision and practices in rehabilitation and that weekend service provision in Australia was more prevalent than previously found in the literature. Therefore, an electronic survey was distributed to all Australian hospitals with a dedicated rehabilitation unit. The survey investigated current weekend service delivery, service provision staffing and models, as well as clinician identified barriers and facilitators to providing a weekend rehabilitation service. Clinician perspectives on weekend service provision in rehabilitation were also explored to determine the acceptability by clinicians of providing this service and appropriateness of the given service.

A response rate of 83% (n=179) was achieved finding that 57% of the facilities provided a weekend service. This was most commonly provided as a half-day, Saturday service, in private, metropolitan facilities and staffed with physiotherapists and therapy assistants. Regardless of whether the facility provided weekend therapy, clinicians reported that the most common barriers to providing a weekend service were budgetary restraints and staffing availability, while facilitators included organisational and staffing support, and staffing availability. Prior research or benchmarking before weekend service implementation was not commonly completed. Most facilities utilised the FIM, AROC and LOS data to evaluate their service, and reported increased patient/family satisfaction, faster goal attainment and reduced LOS as the most commonly perceived benefits. Clinicians were supportive of weekend service provision in rehabilitation, perceiving the service resulted in positive outcomes for patients.

9.1.6 Chapter 8 – Study 5 – Multidisciplinary 6-day rehabilitation service – a pragmatic implementation

In response to feedback received in the formative evaluation completed in Chapter 6, clinician perspectives in Chapter 7 and rehabilitation guidelines, the 6-day physiotherapy service was modified to a multidisciplinary service. Occupational therapy was included in the Saturday service, providing a four-hour service on a Saturday, with an allied health assistant completing porterage and therapy assistance where required, instead of the assistant-in-nursing staff member used previously. Utilising similar methods to Chapters 4 and 5, Chapter 8 investigated the effect of multidisciplinary staffing on weekend therapy service provision, and the effect on LOS, functional independence, physiotherapy gait and balance measures and implementation costs.

Chapter 8 compared a historical control (n=174) receiving usual care of 5-day rehabilitation with a Saturday physiotherapy service, with a prospective cohort (n=192) receiving usual care with a multidisciplinary Saturday service. More participants (83%, n=160) in the multidisciplinary group attended 6-day therapy, attending more sessions and spending more time in therapy on a Saturday compared to those receiving the physiotherapy service (72%, n=126). Participants receiving the multidisciplinary service had a significant reduction in LOS of 2.4 days compared to the physiotherapy service. Participants in the physiotherapy group had lower cognitive FIM scores on admission, and generally performed at a lower level in gait and balance measures on admission compared to the multidisciplinary group. No difference was found in discharge FIM scores; however, the physiotherapy group had a greater FIM change score compared to the multidisciplinary group. When comparing only those participants receiving weekend therapy, participants in the prospective cohort had a significantly shorter rehabilitation LOS compared to the control group by 3.5 days. Participants in the physiotherapy group had significantly lower total and cognitive FIM scores on admission and performed worse on physiotherapy gait and balance measures on admission compared to those in the intervention group. There was no difference in discharge FIM scores or FIM efficiency between groups, however the physiotherapy group had a significantly greater FIM change compared to the intervention group. When admission FIM scores were taken in to account, a trend for a reduction in LOS of 1.5 days was found with multidisciplinary 6-day service provision. A cost-minimisation analysis revealed providing the multidisciplinary service over 20 weeks resulted in cost savings for the hospital of just over $280,000.

9.2 Discussion and clinical implications

From the studies included in this thesis, a number of clinical implications have emerged and will be explored. Weekend rehabilitation in Australia is growing. The benefits of rehabilitation service provision will be discussed, as will considerations for the models of weekend therapy delivery. The impact of weekend rehabilitation provision on different diagnostic groups will be examined along with eligibility criteria that may be used to determine which patient populations might benefit the most from weekend rehabilitation services. The impact of clinician perspectives on weekend therapy implementation will be discussed. The concept that implementation costs may not be a barrier to weekend service provision in rehabilitation will be explored, as will the differences in weekend service provision between private and public hospital sectors.

Following this, recommendations for clinical practice and future research, study strengths and limitations will be explored, and conclusions to this thesis drawn.

9.2.1 Weekend rehabilitation in Australia is growing, but remains lower than other countries

It appears that the adoption of weekend therapy in Australian rehabilitation units is increasing, with more rehabilitation units around Australia providing weekend therapy. In 2011, 30% of rehabilitation facilities in Australia (termed subacute in the original article) provided a Saturday service, and 12% provided a Sunday service (Shaw et al., 2013). The number of rehabilitation units providing weekend therapy appears to have increased since that time. The pilot study reported 62% of rehabilitation units from around Australia provided weekend therapy (Chapter 3) though this finding was likely to be inflated due to purposive sampling of rehabilitation facilities.

Regardless, the finding of 57% of facilities providing a weekend service in the more comprehensive national survey (Chapter 7) suggested increased provision of weekend rehabilitation in Australia.

Reasons for this increase over the past five to ten years is not clear. More rehabilitation units may be providing weekend therapy due to the emerging literature on benefits associated with rehabilitation weekend service provision (Sarkies, White, Morris, et al., 2018; Scrivener et al., 2015), or due to the growing evidence supporting increasing intensity of practice (Sehatzadeh, 2015). The development of standards for the provision of rehabilitation in facilities in Australia (Australasian Faculty of Rehabilitation Medicine, 2011) indicating that allied health therapy should be provided on a minimum of five days per week may be another reason, as might private hospital rehabilitation guidelines indicating multidisciplinary services should be provided 7-days per week (Consultative Committee on Private Rehabilitation, 2016).

However, while adoption of rehabilitation facilities in Australia providing a weekend rehabilitation service is increasing, it appears this is less than that found in other countries. Surveys of rehabilitation facilities in the USA in 1987 (Hooper & Dijkers, 1987) and Canadian acute care community hospitals in 2012 (Ottensmeyer et al., 2012), reported 69% of surveyed facilities provided some form of weekend service provision. USA rehabilitation guidelines state that multidisciplinary intensive rehabilitation services should be provided three hours a day, at least five days a week (Centers for Medicare & Medicaid Services, 2012). Given that this is similar to Australian rehabilitation guidelines (Australasian Faculty of Rehabilitation Medicine, 2011), it is unclear why rates of weekend rehabilitation service provision are lower in Australia. It should be noted that the data from the USA is over 30 years old, so an update is needed to determine if this information is still accurate. While rehabilitation guidelines for Canada could not be found, stroke

guidelines recommend early intensive rehabilitation for patients in the acute and subacute stages (Heart and Stroke Foundation, 2018). An interpretation of these guidelines may explain the increased number of weekend services provided in rehabilitation. There are also fundamental differences in health care service provision between the three countries, with Australia and Canada spending just under 10% of gross domestic product on health care, compared to USA's 17.2% (OECD, 2017). In the USA, the government funds approximately 30% of health care spending, with the rest being privately funded (OECD, 2017). In contrast, in Australia and Canada the government funds nearly 70% of health care expenses, with the remainder being privately funded (OECD, 2017). However, neither rehabilitation guidelines, nor health care practices suggest a reason as to why weekend rehabilitation services are provided at a lower rate in Australia compared to Canada and the USA. An RCT protocol has been published that will investigate the success of research implementation strategies to promote evidence based allied health resources on a weekend, which may lead to higher rates of weekend service provision in the future (Sarkies, White, Henderson et al., 2018).

9.2.2 Benefits of weekend rehabilitation service provision

Weekend therapy service provision in rehabilitation appears to be beneficial to the patient, hospital and health care system.

9.2.2.1 Length of stay

The studies in this thesis found small, non-significant reductions in LOS with implementation of a 6-day service (Chapter 4) and with modification to rehabilitation staffing of the 6-day service (Chapter 5), as well as a significant reduction in LOS with the implementation of a multidisciplinary

6-day service (Chapter 8). Average LOS in the studies completed for this thesis were similar to the RCTs investigating 6-day physiotherapy (Brusco et al., 2007) and multidisciplinary services (Peiris, Shields, et al., 2013). Over the duration of the series of studies presented in this thesis (2010 to 2016) there was a reduction in the average LOS of patients in this rehabilitation unit by 5.5 days (Chapters 4, 5 and 8). While this reduction cannot be considered a direct result of the implementation and subsequent modifications to the weekend service alone, it should be considered important. It may be that with the small service changes that likely occurred throughout this series of studies, services can become more efficient over time, resulting in better outcomes for patients and hospitals.

9.2.2.2 Patient outcomes

Weekend service provision has also demonstrated improvements in functional independence. The studies in this thesis found improvements in FIM change (Chapters 4 and 5) and FIM efficiency scores (Chapter 5) with weekend service implementation, supporting other recent studies (Hakkennes et al., 2015; Peiris, Shields, et al., 2013). These differences in FIM scores noted from admission to discharge between groups, across the included studies, while statistically significant, are likely quite small clinically. Discharge FIM scores appear to be similar across the studies in this thesis (106-109/126) (Chapters 4, 5 and 8), lending support to suggestions that there is a minimum functional capacity required for discharge to the community (Kuys et al., 2016). The cumulative FIM change scores increased over the three studies completed for this thesis, from 11.3 in Chapter 4 to 21.8 points in Chapter 8. This observed cumulative trend of improved FIM change scores appears to be due to lower admission FIM scores observed across the studies in this thesis (from 93-96 in Chapter 4 compared with 82-88 in Chapter 8). This suggests that participants were being

admitted to this rehabilitation unit either earlier, or at lower functional levels in the latter studies, compared to the earlier studies (Chapters 4, 5and 8).

Improvements in some balance outcomes were shown with the provision of weekend services in rehabilitation. Chapter 4 found improvements with 6-day rehabilitation service provision in TUG, FR and BOOMER when comparing those in the intervention group receiving 5-day and 6-day rehabilitation. Chapter 5 found improvements in FR and BOOMER when 6-day physiotherapy was provided by rehabilitation staff to orthopaedic populations. Chapter 8 found greater improvements in TUG with multidisciplinary 6-day service provision compared to 6-day physiotherapy provision. However, these were quite small differences. Changes found for the BOOMER were clinically significant (Haines et al., 2007), however minimal clinically important differences could not be found for the elderly population in order to compare the changes found for TUG or FR in the studies included in this thesis. Balance has previously been shown to improve following weekend rehabilitation (Scrivener et al., 2015) along with time spent upright (Peiris et al., 2012a) and physical activity (Peiris et al., 2012a; Peiris et al, 2018; Scrivener et al., 2015), not only on the day weekend rehabilitation was received but also in the days following, taking more steps compared to patients not receiving weekend therapy (Peiris et al., 2012a).

9.2.2.3 Economic impact

Provision of a 6-day multidisciplinary rehabilitation service led to cost savings for the hospital of over $280,000 (Chapter 8). Previous cost effectiveness studies have found that 6-day multidisciplinary rehabilitation services are likely cost effective at 30 days and 12 months following discharge from hospital, with no increase in costs to the community health sector following discharge (Brusco et al., 2014, 2015). These findings of reduced costs associated with weekend

service provision in rehabilitation in this private hospital may address some clinician-reported barriers found in Chapter 7, with many clinicians at rehabilitation facilities reporting budgetary restraints were a barrier to weekend service provision in the national survey. This could result in increased adoption of weekend rehabilitation service provision.

There appears to be several benefits to the provision of weekend rehabilitation services, however it remains unclear why benefits associated with weekend therapy appear to differ across studies. It is possible that for late week or weekend admissions, weekend therapy allows for the rehabilitation process to start earlier. Additionally, it may mean that admission assessments are completed earlier resulting in more accurate reporting of patient functional level at admission, allowing for a better indication of how patients are changing over their rehabilitation admission. Weekend therapy appears to result in patients being more physically active over the weekend (Peiris et al., 2012a; Scrivener et al., 2015). Increasing activity in the inpatient rehabilitation setting has been shown to improve function (Janssen et al., 2014; Scrivener et al., 2015; Sehatzadeh, 2015). Weekend therapy may also provide patients with opportunities for more repetitions of task practice or may enable patients to consolidate skills learnt during the week. The principles of neuroplasticity indicate that high levels of repetition are required for skill acquisition (Kleim & Jones, 2008). Providing patients extra opportunity to practice and progress skills learnt during the week, may help to improve function, have functional improvements occur at a faster rate, and therefore contribute to reducing LOS. Investigating the number of task repetitions achieved on a weekend compared to a weekday, or over the whole rehabilitation admission, of those receiving 5- and 6-day rehabilitation may assist in answering this question. It is difficult to determine what factors contribute to the benefits accrued by weekend therapy, and

indeed it is highly likely that improvements may be attributed to multiple and/or additive factors. Further investigation is warranted.

9.2.3 Staffing model of weekend rehabilitation service provision is important

While the general outcomes of weekend service provision show a trend towards a reduction in LOS, improvements in functional independence, cost effectiveness of the service and improvements in QOL, these outcomes appear to vary with different staffing models.

9.2.3.1 Staffing currency of practice is important

Provision of weekend rehabilitation services by staff currently working in rehabilitation led to an increased number of participants attending the weekend service and spending more time in weekend therapy (Chapter 5). There was also a further small non-significant reduction in LOS compared to acute staffing of the weekend service, and further improvements in FIM change and efficiency scores, with no change in gait and balance measures when the weekend service was staffed with rehabilitation staff. This suggests that utilising staff currently working or with experience in rehabilitation when staffing a weekend rehabilitation service may result in better patient outcomes. It should be noted that the years of experience in rehabilitation between staff currently working in rehabilitation and acute wards was not significantly different, although some may argue that this was clinically different (rehabilitation staff = 3.28 years compared to 1.28 years in acute staff). Clinically, this may mean that there is increased need for rehabilitation staff to work weekends, or that there is a greater need for flexibility of staffing required in rehabilitation to accommodate weekend staffing. Finding a method to achieve this without impacting on continuity of care will need further consideration by each rehabilitation facility.

9.2.3.2 Multidisciplinary staffing appears to make a difference

The outcomes found with the multidisciplinary service model investigated in this thesis, at least for LOS, were significant. The multidisciplinary service model was the only model in this thesis that resulted in a significant reduction in LOS, despite differences in admission functional levels. But is it simply the addition of occupational therapy and allied health assistant services that have led to this? Organised multidisciplinary rehabilitation care has been shown to lead to improved patient outcomes (Langhorne & Duncan, 2001), and would likely lead to more efficient management of patient care. Occupational therapists in Chapter 8 of this thesis treated an average of six participants on Saturday (roughly one quarter of the rehabilitation unit), with participants receiving weekend occupational therapy input attending an average of one hour each of assessment and treatment on a weekend during their rehabilitation stay. While this is likely to have provided participants with extra therapeutic input, it seems unlikely that this alone would have accounted for the greater reduction in LOS seen in this study. Interestingly, physiotherapy occasions of service delivered as part of the multidisciplinary weekend service in Chapter 8 increased compared to physiotherapy-only weekend services. Perhaps, the addition of an allied health assistant to the weekend service contributed to this. However, multidisciplinary team management in rehabilitation is quite complex, and the impact is often greater than the sum of the individual disciplinary input. It is possible that the combination of both the additional occupational therapy and increased physiotherapy input contributed to the reductions in LOS. There was no difference in the cohort of patients receiving the multidisciplinary service in terms of functional level, in fact the admission FIM scores in this study were very similar to the intervention group in Chapter 5. However, while there was a reduction in LOS, it appeared to be quite a uniform reduction in LOS, with the spread of LOS results being much smaller than in the other

studies within this thesis (SD = 6.99 in Chapter 8 compared to 10-13 in Chapters 4 and 5). This is especially important due to the mixed rehabilitation population who participated in this study. It is unclear whether the benefit seen in this study was purely due to the multidisciplinary therapy of the weekend service, improvements in effectiveness over time, or the increased efficiency and occasions of service that a multidisciplinary service enables.

Further research is required into the efficacy of physiotherapy compared to multidisciplinary service provision in weekend rehabilitation services. This will assist in understanding whether the addition of occupational therapy services resulted in greater service utilisation and reduction in LOS, or whether it was increased service efficiency over time that led to the findings in Chapter 8. Future research should also be completed to determine the most beneficial multidisciplinary combination of allied health disciplines.

9.2.4 Eligibility criteria for weekend rehabilitation services

The eligibility criteria for patients to receive weekend rehabilitation therapy used in the studies in this thesis was based on findings from the pilot study (Chapter 3) and the formative evaluation (pre-implementation survey, Chapter 6). Eligibility criteria to determine patient suitability for rehabilitation has received little investigation. A wide variety of criteria are used by medical consultants to determine patient suitability for rehabilitation and the need for further rehabilitation (Hayward, Aitken, Barker, & Brauer, 2014; Putman et al., 2007). Similarly, the national survey (Chapter 7) illustrated that a wide variety of factors are used by rehabilitation facilities to determine which patients should be allocated to weekend therapy. Only one other study investigating weekend service provision reported criteria to determine who was eligible for weekend service inclusion (Hakkennes et al., 2015). This study reported that all patients were

eligible for the service, however were prioritised according to the goals of the service – new admission, facilitation of discharge and provision of therapy to patients likely to deteriorate without weekend therapy (Hakkennes et al., 2015). Approximately 45% of facilities in the national survey provided weekend rehabilitation to all patients in their facility (Chapter 7). While such an approach maximises inclusion of patients to participate in weekend therapy, this may not be realistic in a pragmatic implementation of a weekend service, where reduced staffing may mean that not every patient can be seen on a weekend.

9.2.4.1 Different diagnoses respond to weekend therapy provision differently

Weekend service provision may impact different patients in different ways. It is possible that diagnostic groups respond differently to 6-day therapy provision. Chapter 5 investigated the impact of a 6-day physiotherapy service on diagnostic groups. A non-significant reduction in LOS of four days in participants with a neurological or reconditioning diagnosis was found. However, participants with an orthopaedic or neurological diagnosis demonstrated better functional improvements. It may be possible that these groups respond well to 6-day physiotherapy for different reasons. The diagnostic mix of the rehabilitation unit may determine whether there is benefit in only providing weekend therapy to certain diagnoses. Given Australia's ageing population (AIHW, 2017b) and the increased need for hospitalisation of the older population (AIHW, 2013, 2016b), it is likely that if the service were targeted to diagnostic groups with the greatest reductions in LOS (neurological and reconditioning) this could have the greatest impact for hospital flow and costing. However, targeting those who would receive the most functional benefit (orthopaedic and neurological) may lead to reductions in hospital readmissions and therefore reduce hospital costs. While the aim is always for a patient-centred care approach,

pragmatically in the Australian private sector, rehabilitation funding (and therefore services) are currently tied to diagnostic groups.

The diagnostic spread of populations in mixed rehabilitation facilities includes a large proportion of orthopaedic patients (Chapters 4, 5 and 8) (AROC, 2018; Kuys et al., 2016). While LOS reductions for orthopaedic populations found in this thesis were small, hospital cost savings may be possible to a high volume of this type of patient group (AROC, 2018). Future research could determine comparative cost savings of providing weekend rehabilitation services to diagnostic groups that have greater reduction in LOS (neurological and reconditioning populations) to high volume populations that have smaller reductions in LOS (orthopaedic populations). Regardless, it is important to ensure that patients continue to be discharged at a similar functional level to ensure that costs are not transferred onto community services.

It is also important to consider the impact of multiple comorbidities on a patient's ability to participate in rehabilitation. The diseases associated with ageing discussed in Section 2.1.1 – arthritis, osteoporosis, cancer, cardiovascular disease, dementia, diabetes mellitus, kidney disease and obesity all play a role in increasing disability in the ageing population (ABS, 2012; AIHW, 2013). The number of people in Australia with these comorbidities is over 85% of the older population (ABS, 2016) and just under half the population of 65-74 year olds not in residential care had five or more of these condition in 2009 (AIHW, 2013). Managing and treating individuals with these conditions increases the burden on the health care system. It can also influence a patient's stay in rehabilitation, or the need for someone to attend rehabilitation instead of being able to discharge home independently from the acute wards. For example, a person with a fractured ankle, obesity and shoulder/upper limb arthritis will likely require a longer hospitalisation, and possibly

rehabilitation, compared to a person of the same age without these comorbidities. The diagnoses recorded in Chapters 4, 5 and 8 were the reason for admission to rehabilitation, and classified in a method based on that collected by AROC (AROC, 2016b). Data was not collected on the number or type of comorbidities the participants had. Therefore, it is not possible to tell what the impact of these comorbidities had on the outcomes collected in this thesis.

9.2.4.2 Patients of different functional levels respond to weekend rehabilitation service differently

Participants allocated to the weekend service also tended to be more functionally dependent on admission, with lower admission FIM scores than those not allocated to weekend services (Chapters 5, 6 and 8). Additionally, participants with lower admission FIM scores who received weekend physiotherapy made greater FIM changes from admission to discharge, with no impact on LOS. Similar findings have been shown in a comparative study investigating patients in a rehabilitation unit over several years (Kuys et al., 2016). This is likely because patients with lower functional levels have more potential to improve. People with stroke with lower admission functional levels similarly achieved the greatest motor FIM change by discharge (Hayward, Kuys, et al., 2014). Staff surveyed in the formative evaluation also felt that more patients with lower functional independence should be allocated to weekend rehabilitation therapy, in order to maximise time in therapy, and functional gains (Chapter 6).

Further research into how different diagnoses and patients of differing functional levels respond to weekend service is needed to ensure that eligibility criteria for weekend rehabilitation is supported by evidence rather than clinician perspectives. Further economic investigation should also be completed to determine which populations receiving weekend therapy lead to the greatest cost savings and efficiency improvements for facilities and the health system in general.

9.2.5 Clinicians perceive weekend therapy to be beneficial

Clinicians themselves generally have a positive view of weekend rehabilitation service provision (Chapter 7). The national survey found that regardless of whether a clinician was from a facility providing a weekend rehabilitation service or not, clinicians felt that weekend services were beneficial for patients in terms of increasing patient activity and intensity of practice, reducing slip-back of progress over weekends and achieving faster goal attainment. This finding that clinicians perceive weekend services would improve patient activity is important given that orthopaedic patients in rehabilitation were found to be not meeting physical activity guidelines for older adults (Peiris, Taylor, et al., 2013). Both clinicians and patients feel that people who have had a stroke would benefit from increased amounts of physiotherapy (Galvin, Cusack, & Stokes, 2009), and people receiving rehabilitation for orthopaedic conditions also report they would prefer increased physiotherapy input (Peiris et al., 2012b).

9.2.5.1 Clinician satisfaction with weekend service provision can change over time

Results from the national survey indicated that clinicians from facilities providing a weekend service were generally more satisfied with the weekend service provided at their facility, and perceived that patients achieved faster goal attainment compared to clinicians at facilities not providing a weekend service (Chapter 7). Staff perspectives at the facility where the 6-day service in this thesis was implemented were also explored (Chapter 6). Initially, staff identified a number of barriers regarding the implementation of the 6-day service including issues related to staffing, nursing staff expectations, patient allocation, patient impact and effectiveness of the service. When surveyed again following implementation of the survey, the number of issues identified was

significantly reduced. Once implemented, staff seemed to see the value in the service and offered suggestions to improve the service and to allow more patients to attend.

9.2.5.2 Clinician support could help address barriers and facilitators to weekend service provision

Clinicians reported that a major facilitator of weekend rehabilitation is staff support (Chapter 7). Involving staff in co-design and implementation, and frequently receiving staff feedback on service performance, leads to a more successful implementation of a new service (Donaldson & Finch, 2012; Kotter & Schlesinger, 2008; Melton & Hartline, 2010; Shee et al., 2014; Yang et al., 2016). This factor combined with the findings that weekend rehabilitation services lead to cost savings for hospitals and health services may help to overcome the most common clinician reported barriers of organisational support and budgetary restraints (Chapter 7).

As shown from the barriers identified in the national survey, staff and organisational support are necessary to implement a new initiative. Ensuring that staff feel included in decision making processes regarding implementation is imperative to ensure staff support and acceptability (Melton & Hartline, 2010). In order to facilitate this, staff should be provided with transparent information regarding the reasons for change, and the evidence surrounding potential changes. It is also important to provide staff with opportunities to provide feedback and voice concerns about barriers that may impede the implementation of a new service, as this enables staff to feel valued and included, as well as increasing their support and participation (Kotter & Schlesinger, 2008; Melton & Hartline, 2010).

The implementation of the weekend rehabilitation service at the participating facility included in this thesis was accompanied by a formative evaluation presented in Chapter 6. A large number of

barriers were identified by rehabilitation staff at this facility prior to implementation. Surveying staff and receiving their feedback on the feasibility of implementing the service prior to implementation allowed for the troubleshooting of barriers to ensure that these issues were addressed. Following implementation, fewer barriers were identified. Instead, suggestions were made to expand and improve the service to provide the weekend rehabilitation service to a larger number of patients, and those who required a higher level of care. This suggests that staff supported and were satisfied with the service provided, which would likely not have occurred had staff not felt engaged with the service implementation process, or felt that their concerns were being heard.

9.2.5.3 Clinicians feel weekend services should be provided as multidisciplinary services

Respondents in the national survey perceived that weekend rehabilitation services should be multidisciplinary, regardless of whether weekend service rehabilitation was provided or not (Chapter 7). Interestingly, this was more so for clinicians at facilities not providing a weekend service (Chapter 7). Despite this, less than 20% of facilities providing a weekend service reported having a multidisciplinary service (Chapter 7). Similarly, the formative evaluation also highlighted that staff were in agreement that the weekend service provision should be provided by multidisciplinary staffing (post-modification survey, Chapter 6). It appears that these perceptions have some merit, at least from a service perspective, with the multidisciplinary model as reported in Chapter 8 demonstrating greater reductions in LOS and improved service efficiency.

Clinician engagement and feedback should be explored alongside different models of weekend service provision, in order to determine how staff perceive the service should be implemented. In this thesis, staff perspectives have only been explored with the implementation of a physiotherapy

6-day service. It would be useful to evaluate any changes with the addition of the occupational therapy service or other multidisciplinary services.

9.2.6 Patient and family perspectives need to be considered

While clinician and staffing perspectives have been explored, there has been little investigation of patient and family perspectives of weekend rehabilitation service provision, and no involvement in the co-design of services. The most frequently reported benefit of weekend service provision by clinicians was increased patient and family satisfaction (Chapter 7). However, only two studies investigating weekend therapy provision were found to have investigated patient satisfaction (Peiris et al., 2012b; Ruff et al., 1999). Six-day therapy seems to be preferred compared to both 5-day therapy for patients with an orthopaedic diagnosis (Peiris et al., 2012b) and 7-day therapy for patients with a stroke diagnosis (Ruff et al., 1999). This may be because patients receiving 6-day physiotherapy felt that the extra day was an extension of their therapy program during the week, helped to consolidate gains made during the week, helped to keep them moving and using their muscles, and did not feel that they missed out on rest time with an extra day of physiotherapy (Peiris et al., 2012b). Future research could explore this further.

One reason for the staff perception that patient and family satisfaction is increased with weekend rehabilitation could be due to the increased activity levels over the weekend. Patients undergoing rehabilitation following stroke report that they would benefit from increased physiotherapy time (Galvin et al., 2009; Luker, Lynch, Bernhardsson, Bennett, & Bernhardt, 2015), sentiments echoed in orthopaedic populations undergoing rehabilitation (Peiris et al., 2012b). It has been found that people undergoing rehabilitation post stroke report reduced opportunity to practice in their own time, due to lack of access to appropriate equipment or a structured homework program (Eng et

al., 2014). With these in place, patients in rehabilitation may have the opportunity to be more active outside of therapy times as well. A possible benefit of weekend service provision in rehabilitation may be increased involvement and understanding of the family of the rehabilitation process, and therapy that the patient is undertaking. Interestingly, patients receiving 5-day physiotherapy felt that an extra day of physiotherapy would negatively impact on their rest requirements, as well as visiting time (Peiris et al., 2012b). These perspectives may differ between patients at public and private hospitals. While a lack of rest time for patients was an initial concern identified by staff in the formative evaluation study (Chapter 6), it was not reported in surveys following implementation. Consultation with patients and families in a co-design process is ideal when developing new approaches to services (Robert et al, 2015), and requires further investigation in weekend rehabilitation service provision.

Patient and family satisfaction have only been investigated as part of an RCT (Peiris et al., 2012b). It would be beneficial to evaluate patient and family satisfaction in an effectiveness trial of a weekend rehabilitation service where not all patients receive the weekend rehabilitation. It is important to understand patient preferences about week day and weekend therapy models, in order to improve patient and family satisfaction with rehabilitation services. The drive to improve patient and family satisfaction may be a contributing factor to the private sector providing more weekend services than the public sector. It would also be beneficial to investigate patient and family perspectives on the difference between 6- and 7-day service provision to see if 7-days of therapy intervention does impact on patient's rest requirements, and how this impacts functionally without a rest day.

9.2.7 Barriers and facilitators to providing a rehabilitation service

Budgetary restraints, staffing availability, organisational and financial support are important factors to consider when it comes to implementing a weekend rehabilitation service. The national survey identified clinician perspectives on barriers and facilitators to weekend service provision (Chapter 7). Regardless of whether a weekend service was provided or not, facilities identified budgetary restraints and staffing availability as the biggest barriers to providing the service, with facilities not providing a weekend service also reported that organisational support was a significant barrier.

9.2.7.1 Costs are still a likely barrier to weekend service provision

It is interesting that budgetary restraints are perceived as one of the biggest barriers to weekend allied health service provision in rehabilitation, given that weekend services have been shown to likely be cost effective (Brusco et al., 2014, 2015), and result in a saving for the hospital (Chapter 8). This may be an issue for allied health departments, with the cost of providing the weekend service attributable to allied health budgets, and cost savings relating to the rehabilitation ward (with a reduced LOS and greater throughput of patients) or the hospital as a whole. This is a challenge for facilities to ensure that departments providing services that lead to cost savings for the hospital are provided appropriate resources to staff these services appropriately.

9.2.7.2 Limitations in staffing availability

At the facility where the 6-day service was introduced in this thesis, rehabilitation weekend services were staffed with rehabilitation staff working approximately one weekend a month (Chapter 5). Rostering staff with appropriate experience to provide weekend rehabilitation

services may be a challenge for facilities. It is possible that there are limitations in staffing availability which may be due to staff already providing weekend acute services, a lack of appropriately skilled staff with currency of practice in rehabilitation such as in small hospitals or regional areas, or that staff working in rehabilitation are reluctant or not available to work weekends. Such issues will need further consideration by facilities exploring the feasibility of implementing a weekend rehabilitation service.

9.2.7.3 Organisational support requires clarification

Organisational support was another barrier identified by facilities not providing a weekend service. It is hard to know, given the population responding to the survey was physiotherapy staff and not necessarily managers, whether this lack of organisational support was assumed, or whether it had been openly stated and discussed. Organisations may feel that despite evidence for likely cost effectiveness (Brusco et al., 2014, 2015), and increased throughput of patients in rehabilitation (DiSotto-Monastero et al., 2012; Hakkennes et al., 2015), the lack of a statistically significant change in LOS (Brusco et al., 2007; DiSotto-Monastero et al., 2012; English et al., 2015; English et al., 2016; Hakkennes et al., 2015; Peiris, Shields, et al., 2013; Ruff et al., 1999; Chapters 4 and 5) may make implementing a weekend rehabilitation service less appealing. The driving factors in overcoming this may be different between the private and public sector due to different underpinning fiscal frameworks.

Guidelines underpinning private hospital-based rehabilitation services indicate that rehabilitation services should be multidisciplinary in nature and available 7-days per week (Consultative Committee on Private Rehabilitation, 2016), which differs from the Standards for the provision of inpatient rehabilitation in public and private sectors (Australasian Faculty of Rehabilitation

Medicine, 2011) stating rehabilitation services should be provided on a minimum of 5-days per week. If private health insurers in Australia held private rehabilitation facilities to the earlier statement, it is likely there would be increased organisational support for weekend rehabilitation services in the private sector. It may be that as more research and evidence emerges on the benefits of weekend service provision, cost effectiveness, and optimal staffing models, these barriers may be addressed. The future RCT investigating implementing evidence-based service recommendations on weekend allied health services in rehabilitation may also help to address these barriers (Sarkies, White, Henderson et al., 2018).

9.2.7.4 Adding support to facilitators of weekend service provision

Perceived facilitators to providing a weekend service were similar amongst facilities providing or not providing a weekend service (Chapter 7). These included organisational support and staff availability. However, facilities not providing a weekend service reported financial support was an important facilitator to providing a weekend service, while facilities with a weekend service already in place felt that staff support was a more important facilitator. In facilities already providing a weekend service, financial support was reported as a facilitator by less than 30% of facilities (Chapter 7). A recent RCT found that a 6-day physiotherapy and occupational therapy service in rehabilitation was likely cost effective at 30 days and 12 months following discharge, in terms of quality-adjusted life years and minimal clinically important difference in functional independence gained (Brusco et al., 2014, 2015). These findings combined with the results of the cost-minimisation analysis completed in Chapter 8 suggest that the improvements made during a patient's rehabilitation admission outweigh the cost of providing the service. Therefore, the implementation of a weekend service in rehabilitation appears to be a financially viable option, at

least in some facilities. These findings could be presented to allied health managers and hospital executives to provide evidence that rehabilitation weekend services are financially viable and lead to benefits for both patients and hospital services.

In order to address clinician reported barriers to weekend rehabilitation service provision, further research needs to be completed into the economic benefits of weekend service provision, and the true nature of what organisational support entails. With increased research into the optimal methods to staff a weekend rehabilitation service, more will need to be done to investigate how staffing availability can be facilitated.

9.2.8 Private versus public weekend rehabilitation service provision

Differences have been found in weekend service provision rates between the public and private sectors, with more private facilities providing a weekend service compared to their public counterparts in Australia.

9.2.8.1 More private facilities are providing rehabilitation weekend services

Private rehabilitation facilities appear to be embracing weekend therapy provision more than public facilities. Of the facilities surveyed in the national survey, 91% of private facilities provided a weekend service (Chapter 7). Of these, 65% of facilities provided a 6-day service, with the remaining 35% providing a 7-day service. The majority of these facilities are providing half day Saturday services, followed by full day Saturday services, most commonly staffed with physiotherapists and therapy assistants. While information was not collected in the national survey as to why facilities were providing their current service, it is possible that the higher

proportion of privately funded facilities providing a weekend rehabilitation service than that in the public sector is due to the Guidelines for private rehabilitation hospitals stating that multidisciplinary rehabilitation services should be provided 7-days per week (Consultative Committee on Private Rehabilitation, 2016). This increased adoption of private facilities providing weekend services is also seen in the acute sector (Shaw et al., 2013), suggesting that private facilities are more open to providing weekend services compared to their public hospital counterparts. It is possible that a 6-day service is the most common service delivery method as this is the method used in RCTs that have recently investigated weekend service delivery. However, the methods in these RCTs utilised both physiotherapy, and physiotherapy and occupational therapy service provision. Given that the Guidelines for private rehabilitation services also state that weekend services should be multidisciplinary, it is unclear as to why the services being provided in the private sector are largely physiotherapy only services.

9.2.8.2 Why are only a quarter of public rehabilitation facilities providing a weekend service?

Twenty-six percent of public facilities surveyed in the national survey provided a weekend rehabilitation service (Chapter 7). With recent studies showing a non-significant (though likely clinically significant) reduction in LOS by up to 3.2 days (Brusco et al., 2007; Peiris, Shields, et al., 2013), significant improvements in functional mobility (Peiris, Shields, et al., 2013), and likely cost effectiveness up to a year following admission with a 6-day service model (Brusco et al., 2014, 2015), it is surprising that more public facilities do not provide a weekend rehabilitation service. It may be that this differs by states. The national survey in Chapter 7 found that more rehabilitation facilities in Victoria provided a weekend service than those facilities not providing a weekend service. This is the opposite for Australian Capital Territory and Queensland, with more facilities surveyed not providing a weekend service. New South Wales, South Australia, Tasmania, and

Western Australia had relatively similar rates of rehabilitation facilities providing or not providing a weekend service. It is unclear whether differences in state funding may explain these differences in weekend service facility uptake. It may simply be that public services are slower to embrace weekend services in rehabilitation than their private sector counterparts.

9.2.8.3 Why is there a difference in service provision?

Perhaps a more pertinent question to ask is why are private facilities providing weekend services so often? There are several reasons that might explain why private facilities are providing weekend services more than public facilities. It is possible that private facilities may be incentivised by health insurance companies for reducing LOS due to funding limitations. As providing weekend rehabilitation results in LOS reductions that are likely clinically significant if not statistically significant (Brusco et al., 2007; Peiris, Shields, et al., 2013), and have been shown to likely be cost effective (Brusco et al., 2014, 2015), this is one method private rehabilitation facilities may implement to reduce LOS. However, this model is similar to the activity-based funding model used in the public health system (IHPA, 2018). Therefore, the rate of uptake of weekend service provision in the public and private sectors should be similar. With the recent development of private rehabilitation guidelines (Consultative Committee on Private Rehabilitation, 2016) implying that rehabilitation services should be provided 7-days per week, it is possible that should health funds hold private rehabilitation facilities to these guidelines, facility funding may be reduced if 7-day per week rehabilitation was not provided, which could be strongly motivating private facilities to provide weekend rehabilitation services.

9.2.8.4 Public rehabilitation facilities are more likely to implement 7-day services

Interestingly, while approximately only a quarter of facilities surveyed in the public sector provide a weekend service, more than half of these provided a 7-day service (Chapter 7). This is not the case in the private sector, with 63% of facilities providing a 6-day service. It is unclear why the most common model of weekend service of the public sector is 7-days and why private rehabilitation guidelines and health funds are pushing towards provision of a 7-day rehabilitation service (Australasian Faculty of Rehabilitation Medicine, 2011; Consultative Committee on Private Rehabilitation, 2016). Regardless, currently there appears to be a lack of evidence to support the benefit of 7-day therapy in rehabilitation. Two studies have compared 5- and 7-day rehabilitation, with non-significant reductions in LOS by one to 2.9 days and no change in functional independence (DiSotto-Monastero et al., 2012; English et al., 2015). Only one study has investigated 6- and 7-day rehabilitation (Ruff et al., 1999), similarly finding no difference in LOS or functional independence, and participants involved in the study preferred 6-day rehabilitation therapy (Ruff et al., 1999). It is difficult to say whether the results of the studies investigating 5- and 7-day therapy are due to a true 7-day service effect, or simply the provision of extra therapy on the weekend. It is unclear what evidence the Guidelines for Recognition of Private Hospital Based Rehabilitation have based their recommendations on, as this was not included in the document (Consultative Committee on Private Rehabilitation, 2016). It may be time for the for these guidelines to be updated in light of more current evidence, and evidence based in Australia, given different models in care are utilised in Canada and the USA. This thesis will provide recommendations for future practice of weekend rehabilitation services later in this chapter. Further research into the impact of a 7-day rehabilitation service on patient outcomes, cost analysis and different populations needs to be investigated, in both RCTs and real world settings,

before it earns its place as an evidence-based recommendation in rehabilitation guidelines and health fund requirements.

9.2.9 Inequalities exist between metropolitan and rural rehabilitation facilities in terms of weekend service provision

Rural rehabilitation facilities have a low rate of weekend service provision, with only 25% of facilities in the national survey providing a weekend service, compared to 66% of metropolitan facilities (Chapter 7). While this was not reported specifically for rehabilitation in an earlier national survey on weekend service provision, only 24% of regional/rural facilities provided a weekend service in 2011 (Shaw et al., 2013). This low service provision rate could be due to a number of factors. The average number of beds in rural facilities is smaller than metropolitan facilities (15 vs 38 beds), and therefore it may be that there are not enough patients to justify a weekend service. Additionally, staffing availability in rural areas could be a bigger barrier compared to metropolitan areas due to a smaller number of therapists working in these rural hospitals. With almost a third of the Australian population living outside metropolitan areas (SARRAH, 2018), a significant proportion of the population have access to less therapy than their metropolitan counterparts. These service inequities may have a significant impact on patient outcomes in rehabilitation, likely leading to poorer outcomes of patients in rural areas compared to metropolitan areas, which have been seen in chronic disease mortality (Chondur, Li, Guthridge, & Lawton, 2014), and higher risk of death in prostate cancer (Yu, Luo, Smith, O'Connell, & Baade, 2014) and heart failure populations (Teng et al., 2014).

9.3 Recommendations

There are a variety of models of weekend therapy that can be introduced to rehabilitation units. However, there is a paucity of research that has investigated the different models. Some of the variations available are listed below (Table 9-1).

Table 9-1: Possible variations of weekend rehabilitation service.

Variations	How these variations could be provided
Days provided	• Saturday • Sunday • Saturday and Sunday
Length of service provided	• Half day • Full day
Disciplines provided	Any combination of • Physiotherapy • Occupational therapy • Speech pathology • Other allied health disciplines
Staffing expertise	• Acute • Rehabilitation
Inclusion criteria	• All patients • Specific populations

9.3.1 Recommendations for clinical practice

Recommendations for weekend service provision in rehabilitation can be made from the results of studies in this thesis, in conjunction with previous research on this topic. The recommendation based on this thesis is that weekend rehabilitation services should be provided as a 6-day service and staffed with physiotherapists and occupational therapists with experience and currency of practice in rehabilitation.

From the evidence presented, it appears beneficial to provide a 6-day rehabilitation service. There appears to be little extra benefit to providing a 7-day service compared to a 6-day service. Further

research is required to investigate whether there is a difference in providing a weekend rehabilitation service on a Saturday compared to a Sunday as well as differences in providing a half-day service compared to a full-day service. It may simply be that the length of the service provided depends on the number of patients in the ward, the efficiency of the treating therapists and timing of treatments. To date, with the current results of the multidisciplinary service (Chapter 8) in this thesis, there is some evidence that providing a multidisciplinary service results in greater benefits to the patients compared to a physiotherapy service alone, however the efficacy of this requires further investigation. No previous studies have investigated the efficacy or effectiveness of a weekend occupational therapy only service in rehabilitation. Only one study has investigated the impact of other allied health disciplines (social work) in weekend service provision, finding increased discharge FIM scores and increased Saturday admissions, but no change in LOS (Hakkennes et al., 2015). However, speech pathology or dietetic impact on weekend service provision has not been investigated. This may be because the number of patients requiring speech pathology input at any one time in rehabilitation is variable, as speech pathology is likely concentrated on the neurological populations such as stroke and Parkinson's disease, and may not be required for reconditioning and orthopaedic populations, and therefore may not justify a fixed service, rather a service provided on a needs basis, which may be difficult to investigate. It is likely that this would be similar for other allied health disciplines. The impact of social work or discharge planning over the weekend would also be interesting to investigate further, as one of the reasons LOS has been seen to lengthen is due to gaps in the continuity of care from hospital to home or delays due to family or the home not being ready (Fontaine et al., 2011). Provision of these services over the weekend, when relatives may not be working, may facilitate improved discharge planning, which could reduce LOS.

Staffing a weekend rehabilitation service with staff with currency of practice in rehabilitation results in a greater reduction in LOS, greater improvements in functional independence and increased intensity of Saturday therapy. This indicates that weekend rehabilitation services should be staffed with therapists with rehabilitation experience. The studies looking at the impact of weekend rehabilitation services have included either all patients (DiSotto-Monastero et al., 2012), or only those fitting specific inclusion criteria (Brusco et al., 2007; Brusco et al., 2014, 2015; English et al., 2015; English et al., 2016; Hakkennes et al., 2015; Peiris, Shields, et al., 2013; Ruff et al., 1999). There have been no differences found in the results of these studies, however the national survey in Chapter 7 revealed that clinicians reported only 45% of facilities included all patients. It is likely more realistic of real world implementation that not all patients are seen, nor are all patients required to be seen, and therefore developing a set of inclusion criteria for weekend services may be a more efficient option. Further research directions suggested throughout this chapter will assist to clarify the gaps existing in the literature surrounding weekend rehabilitation service provision.

To optimise implementation of the recommended provision of weekend rehabilitation services, rehabilitation facility managers and allied health managers, as well people involved in developing rehabilitation guidelines should have a better understanding of the current state of research. Once better informed, managers will be better placed to determine which model of weekend service provision translates best into their workplace. In order to achieve a smooth, positive implementation of weekend services into rehabilitation, change management strategies similar to those highlighted in Chapter 6 should be implemented (Donaldson & Finch, 2012; Kotter & Schlesinger, 2008; Melton & Hartline, 2010). Staff feedback should be sought at multiple time-points throughout the implementation process (Shee et al., 2014), in order to provide feedback,

address barriers, and trouble-shoot problems as they arise (Melton & Hartline, 2010; Yang et al., 2016).

9.3.2 Future research recommendations

Effectiveness research aims to implement the results of efficacy trials into real world contexts, to determine if and how these efficacy results may be replicated. In doing so, this often raises further questions regarding the implementation of these effectiveness studies. Within this discussion chapter, possibilities for future research have been identified within each relevant section, however there are several major areas that will be highlighted in this section. This thesis recommends future research into the response of different populations to weekend service delivery, the effectiveness of different multidisciplinary models in weekend service provision, and the implementation of a weekend service in rehabilitation.

As discussed above, different populations respond differently to weekend therapy, with the results of Chapter 6 showing that orthopaedic populations benefited more from a functional independence perspective, and neurological and reconditioning populations may result in a greater reduction in LOS. Physiotherapy selection criteria for weekend service allocation used in Chapters 4, 5 and 8 were based on findings from the pilot study (Chapter 3), and the pre-implementation survey in Chapter 6. Respondents in the national survey (Chapter 7) reported that facilities used a wide variety of criteria to determine who was allocated to their weekend services. Given that the studies in this thesis were not powered to detect change in different diagnostic or functional groups (Chapter 4, 5 and 8), future research endeavours could investigate appropriately-powered effectiveness studies comparing participants with lower and higher levels of functional independence, or studies comparing the impact of weekend services on different

diagnostic groups, to determine if the diagnostic group results are replicated, or if benefits gained for diagnostic groups are different when comparing to control groups of the same diagnosis. Another, more patient-centred approach could be to compare participants who have the same primary goals (e.g. improve mobility) with and without weekend therapy. Further research determining how different patient populations – either from a diagnostic, functional or goal-oriented perspective – benefit from weekend allied health service provision is needed to refine recommendations regarding those receiving this service and assist in the development of criteria regarding allocation to weekend therapy services.

The effectiveness of a multidisciplinary rehabilitation weekend service compared to a physiotherapy only service has been explored in Chapter 8. More participants receiving the multidisciplinary service were allocated to weekend therapy, they spent more time in therapy on a weekend, and went home sooner compared to those receiving the physiotherapy only weekend service. However, a physiotherapy and occupational therapy combined service is just one of the potential multidisciplinary services that could be offered. Given that usual weekday rehabilitation services generally also involve speech pathology and dietetics, and likely a range of other disciplines including social work and psychology (based on weekend staffing data reported in Chapter 7), exploring the impact of different combinations of multidisciplinary service on a weekend would provide greater insight into which multidisciplinary services should be provided on a weekend. Exploring the implementation of these multidisciplinary services may provide added information as to why multidisciplinary services appear to result in better patient outcomes.

Research into the implementation process of providing a weekend service in rehabilitation would provide greater insight into how to provide a weekend service to best address patient and staff

requirements. Utilising implementation research to investigate why and how weekend service provision improves patient outcomes (Peters, Adam et al., 2013) may provide rehabilitation staff and managers with the information needed to address the barriers and facilitators to providing a weekend service raised in the national survey (Chapter 7). This could be completed using focus groups, interviews or surveys (Peters, Tran et al., 2013) of patients, their families, clinical staff and managers. Utilising the Standards for Reporting Implementation Studies checklist would provide a template for to ensure this research approach was systematic and of high quality (Pinnock et al., 2017).

9.4 Strengths

This research program provided insights into the effectiveness and implementation of weekend service provision in rehabilitation. This effectiveness-implementation hybrid methodology spanning several studies allows clinicians to determine how the evidence found in RCTs could translate and be implemented into everyday practice, with usual care environments and staffing (Ford & Norrie, 2016; Peters, Tran et al., 2013). The chosen methodology of the research program in this thesis took place in a real world environment, to determine if previous findings could be replicated (Ford & Norrie, 2016). This is important as the real world environment of the health care system must evolve and change in the face of the ageing population, and rarely operates in the ideal setting of an RCT.

This research program involved a formative evaluation study and a national survey, involving clinicians to determine barriers and facilitators to translating the evidence found in RCTs into practice, and the adoption, acceptability, appropriateness and feasibility of implementing this 6-

day service at the target facility. It takes 17 years to translate evidence into practice (Slote Morris, Wooding, & Grant, 2011), a process that takes too long for the benefits to be seen when the results are required now, in this ever-changing world. One way that this timeframe may decrease, is for clinicians to be involved and engaged in implementing changes to their workplace. One such method to achieve this is by using formative evaluations. This increases engagement and acceptability, addresses barriers and troubleshoots difficulties with implementation to address appropriateness of the intervention, and increases staff support of the new service. By utilising these methods and receiving staff and clinician feedback on service provision and adoption, this thesis has been able to provide insights into barriers and facilitators that may enable increased implementation of weekend service provision in rehabilitation in the future.

A further strength of this body of research is that it has investigated different services implemented at one site over several years. This has also allowed the opportunity to investigate different service delivery changes and observe and receive feedback on the positives and negatives of these different implementation methods. This methodology is important from a patient and business perspective, as it is vital for services to undergo constant service improvements in order to ensure that the best care is being provided for patients. However, it is also achievable for every rehabilitation facility and service implementation initiative, and health managers should be scrutinising their services to this level constantly.

9.5 Limitations

There are several limitations of this thesis. Firstly, this thesis has used effectiveness-implementation methodology, involving prospective data collection compared with historical control data, and surveys. There was no blinding of assessors in any of the studies included in the

thesis. There could have been confounding factors in any of the studies. While this thesis is not assuming a lack of bias in the studies, it was important for the aims of the thesis that these studies be carried out in a real world context. In defence of this approach, the studies were performed in a linear fashion, and staff were not aware of the plans for upcoming studies, thus their perceptions should not have biased results.

The qualitative method of collecting staff perspectives in Chapter 6, and information regarding weekend service provision in the pilot study (Chapter 3) and national survey (Chapter 7), by use of a survey, is just one methodology that could have been used. While a survey was likely most appropriate for the pilot study (Chapter 3) and the national survey (Chapter 7), a greater use of open-ended questions in the national survey would have allowed for increased understanding of barriers and facilitators, as well as clinician perspectives of weekend service provision. Utilising staff interviews or focus groups to engage staff in the formative evaluation (Chapter 6) may have led to a more in-depth analysis of how and why the 6-day service implemented in this thesis worked, and the barriers and facilitators/strengths and weakness of the service. Focus groups allow for interaction between group participants and are particularly useful in understanding participant's knowledge and experience (Kitzinger, 1995). Focus groups also enable researchers to tap into a variety of communication and can explore and uncover dimensions of understanding that may remain untapped by other conventional data collection techniques, which may have led to a greater understanding of the barriers, facilitators and staff perspectives of implementing the weekend rehabilitation service.

Some implementation outcome variables were not addressed in this thesis. The fidelity of the intervention (the degree to which an intervention was implemented as it was designed) in this

thesis was addressed as the number of participants allocated to the 6-day service that actually attended. As a specific therapy modality was not being investigated, there was no-one tracking what therapy the participants undertook. Therapy was prescribed by the treating therapist, but there was no fidelity checking that the therapy received was what was prescribed. This may have affected the treatment effect. There was also no confirmation that participants met the eligibility criteria. As participant's usual therapist determined who was eligible to receive the 6-day service, it is possible that there may have been some patients included that did not specifically meet the eligibility criteria. Coverage (the degree to which the population eligible to benefit from an intervention actually receives it) was not specifically addressed in this thesis. Participants were deemed eligible to receive the 6-day service by their treating therapists. As there was no one cross-checking to confirm which participants were eligible to receive the 6-day service, it is impossible to know how many participants in the cohorts were eligible to receive the 6-day service, and therefore, how many participants were not allocated to the service due to service limitations. Sustainability (the extent to which an intervention is maintained in a given setting) was also not specifically investigated. It is likely that the 6-day physiotherapy service was sustainable as the service continued to be provided from its introduction in 2011, to the final study in 2017. As extra funding was received in order to provide the occupational therapy service, this thesis is unable to comment on the sustainability of this service. While it is important to note that these variables have not specifically been addressed in this thesis, the authors who identified these variables acknowledged that these variables may have different weights depending on the focus of the intervention or implementation stage (Proctor et al., 2011).

The national survey in Chapter 7 was targeted at physiotherapists. While this was justified as physiotherapy services are the most common weekend service provided in rehabilitation, it may

have led to some bias in the responses received, especially in terms of answering the impact of weekend services seen on ADL achievement or other areas that are not typically the domain of physiotherapists. While respondents were instructed to pass on the survey to the staff member who was best placed to respond to the survey, regardless of staffing discipline, this data was not collected, so it is unclear as to whether the input from other disciplines was collected in this survey.

The studies in Chapters 4, 5, 6 and 8 took place in a single 20-40 bed rehabilitation unit in an Australian private metropolitan hospital, treating a mixed case load with predominately orthopaedic and reconditioning populations over the age of 70 years. The results found when implementing a half-day Saturday service in the rehabilitation unit could be applicable to other facilities of similar size and casemix. As these findings are similar to those found in other studies, reporting a similar effect on LOS (Brusco et al., 2007; Peiris, Shields, et al., 2013) and functional independence (Peiris, Shields, et al., 2013), it is likely that these findings could be reproduced. However, findings may not be generalizable to larger facilities, facilities providing specialised care to specific populations (for example, spinal cord injuries or amputees), facilities in regional or rural areas, or internationally, due to different case mix, staffing regimes and availabilities, or organisational or governmental funding models.

The studies in Chapters 5 and 8 may not have been powered to demonstrate change in LOS. Participants were included in the studies to match similar time frames used in Chapter 4 (which was powered appropriately) however fewer participants were involved in these latter studies, and therefore, the results found in Chapters 6 and 8 may need to be interpreted with caution. This

may be due to the rehabilitation unit in which the studies were taking place reduced from a 40-bed unit in 2011 (Chapter 5), to a 20-bed unit in 2015 (Chapter 8).

It is possible that LOS changes found in this thesis may be due to changes in routine practice over time. With each year that was investigated, LOS was found to be reduced. However, as weekday therapy sessions were not controlled from year to year, it is possible that advances in evidence may have influenced usual practice during the week, leading to better outcomes for patients, rather than solely weekend rehabilitation service delivery. This is supported by reductions in average LOS found in AROC data, with LOS decreasing from 21.8 days in 2000 to 17.6 days in 2016 (AROC, 2013, 2017).

This thesis did not investigate patient/family satisfaction of weekend service provision in rehabilitation. It was originally planned that this would occur, utilising data being collected by the hospital during the multidisciplinary study (Chapter 8). However, the survey in use by the participating facility focused on satisfaction with nursing staff care rather than rehabilitation service provision on the whole, nor did it investigate allied health service provision satisfaction, therefore was unable to be utilised. Further to this, patients and family members perspectives were not sought when designing the weekend service. Given that patients are the recipients of the service, it may have been beneficial to receive input from them regarding how the weekend service could be implemented. Future studies regarding the implementation of weekend therapy in rehabilitation would benefit from investigation of patient and family perspectives in the planning stages prior to implementing a weekend service, as well as patient and family member satisfaction to determine how patients feel about weekend service provision, and what they perceive as the strengths and weaknesses of weekend service provision.

Lastly, QOL was not investigated in this thesis. This was planned to occur in Chapter 8, however, collection of the QOL measure was not possible in the participating facility. Future pragmatic studies investigating weekend services would benefit from the inclusion of this measure as part of the outcomes collected, as QOL has not been investigated in effectiveness trials to date.

9.6 Conclusions

This thesis has contributed original information regarding the implementation of weekend rehabilitation services in Australia. It has demonstrated that Australian weekend rehabilitation services are increasing. Weekend rehabilitation services are mainly provided in private metropolitan facilities, as a 6-day service staffed with physiotherapists and assistants. This thesis has demonstrated similar results from the real world implementation of a 6-day physiotherapy service compared to RCTs completed in recent years, finding that weekend services improve function and may lead to clinically important reductions in LOS. It has demonstrated that the results of weekend service implementation differ depending on staffing models, in terms of currency of practice and multidisciplinary services. This thesis has shown that different diagnostic groups respond differently to weekend therapy provision, with orthopaedic populations achieving greater and more efficient functional improvements, while neurological populations achieved greater FIM efficiency, and both neurological and reconditioning populations achieved a non-statistically significant reduction in LOS by four days, which may be clinically significant. This thesis has found the first statistically significant difference in LOS with multidisciplinary weekend rehabilitation service provision of 2.4 days, compared to physiotherapy-only weekend service provision. Multidisciplinary weekend service provision was also found to result in cost savings for

the hospital of over $280,000 over a 20-week period. This thesis has also investigated staff perspectives of weekend rehabilitation service provision, finding that while clinicians are largely supportive of these services, budgetary restraints, organisational support, and staffing availability are barriers to weekend service provision. However, utilising a formative evaluation alongside the implementation and modification of weekend services found that seeking staff feedback and suggestions assists in the implementation of a new service, and increases staff support of the service. From these findings, it has been recommended that rehabilitation weekend services be provided as 6-day physiotherapy and occupational therapy services staffed with therapists with experience and currency of practice in rehabilitation. It is hoped that in the future, weekend service provision in Australia and rehabilitation facilities will continue to increase, and further research will continue to guide clinicians to the optimal method of weekend rehabilitation service provision to maximise patient outcomes.

List of References

ABS. (2012). *Australian health survey: first results, 2011-12*. (4364.0.55.001). Australia: Commonwealth of Australia Retrieved from http://www.ausstats.abs.gov.au/Ausstats/subscriber.nsf/0/1680ECA402368CCFCA257AC90015AA4E/$File/4364.0.55.001.pdf.

ABS. (2016). *Disability, ageing and carers, Australia: summary of findings, 2015*. Australian Bureau of Statistics.

AIHW. (2013). *Australia's welfare 2013*. (Cat. no. AUS 174.). Canberra: Australian Institute of Health and Welfare.

AIHW. (2015). *Australia's Welfare 2015*. Australia's Welfare Series, no. 12. Cat. No. AUS 189. Canberra: Australian Institute of Health and Welfare.

AIHW. (2016a). *Admitted patient care 2014-15: Australian hospital statistics*. Canberra: Australian Institute of Health and Welfare.

AIHW. (2016b). *Australia's hospitals 2014-15 at a glance*. Canberra: Australian Institute of Health and Welfare.

AIHW. (2017a). *Australia's hospitals at a glance 2015-16*. Canberra: Australian Institute of Health and Welfare.

AIHW. (2017b). *Australia's Welfare 2017*. Canberra: Australian Institute of Health and Welfare.

APA. (2008). Working with a physiotherapy assistant or other support worker. Australian Physiotherapy Association.

APA. (2014). Australian Physiotherapy Association. Retrieved from http://www.physiotherapy.asn.au/APAWCM/Physio_and_You/APAWCM/Physio_and_You/physio.aspx?hkey=1448ce89-2621-4ccf-8b00-ff0d45df985d on 23/6/14.

AROC. (2013a). *The AROC annual report: the state of rehabilitation in Australia in 2012*. Australia; Australasian Rehabilitation Outcomes Centre.

AROC. (2013b). Australasian Rehabilitation Outcomes Centre. Australia; Australasian Rehabilitation Outcomes Centre.

AROC. (2016a). *The AROC annual report: the state of rehabilitation in Australia in 2015*. Australia; Australasian Rehabilitation Outcomes Centre.

AROC. (2016b). Australasian Rehabilitation Outcomes Centre. Australia; Australasian Rehabilitation Outcomes Centre.

AROC. (2017). *The AROC annual report: the state of rehabilitation in Australia in 2017*. Australia; Australasian Rehabilitation Outcomes Centre.

Australasian Faculty of Rehabilitation Medicine. (2011). *Standards for the provision of inpatient adult rehabilitation medicine services in public and private hospitals 2011*. Sydney: The Royal Australasian College of Physicians.

Babu, A. S., Noone, M. S., Haneef, M., & Samuel, P. (2010). The effects of 'on-call/out of hours' physical therapy in acute exacerbations of chronic obstructive pulmonary disease: a randomized control trial. *Clinical Rehabilitation, 24*, 802-809.

Bachmann, S., Finger, C., Huss, A., Egger, M., Stuck, A. E., & Clough-Gorr, K. M. (2010). Inpatient rehabilitation specifically designed for geriatric patients: systematic review and meta-analysis of randomised controlled trials. *British Medical Journal, 340*(7758), 1230-40.

Baruch, Y. (1999). Response rates in academic studies: a comparative analysis. *Human Relations, 52*, 421-434.

Berney, S., Stockton, K., Berlowitz, D., & Denehy, L. (2002). Can early extubation and intensive physiotherapy decrease length of stay of acute quadriplegic patients in intensive care? A retrospective case control study. *Physiotherapy Research International, 7*(1), 14-22.

Bindawas, S. M., Graham, J. E., Karmarkar, A. M., Chen, N., Granger, C. V., Niewczyk, P., . . . Ottenbacher, K. J. (2014). Trajectories in functional recovery for patient receiving inpatient rehabilitation for unilateral hip or knee replacements. *Archives of Gerontology and Geriatrics, 58*, 344-349.

Birkenmeier, R. L., Prager, E. M., & Lang, C. E. (2010). Translating animal doses of task-specific training to people with chronic stroke in 1 hour therapy sessions - a proof of concept study. *Neurorehabilitation and Neural Repair, 24*, 620-635.

Bohannon, R. W. (1997). Comfortable and maximum walking speed of adults aged 20-79 years: reference values and determinants. *Age and Ageing, 26*(1), 15-19.

British Society of Rehabilitation Medicine. (2015). Specialist neuro-rehabilitation services: providing for patients with complex rehabilitation needs. In *Specialised Neurorehabilitation Service Standards*: British Society of Rehabilitation Medicine.

Brooks, R., & EuroQol Group. (1996). EuroQol: the current state of play. *Health Policy, 37*, 53-72.

Brusco, N. K., & Paratz, J. (2006). The effect of additional physiotherapy to hospital inpatients outside of regular business hours: a systematic review. *Physiotherapy Theory and Practice, 22*(6), 291-307.

Brusco, N. K., Shields, N., Taylor, N. F., & Paratz, J. (2007). A Saturday physiotherapy service may decrease length of stay in patients undergoing rehabilitation in hospital: a randomised control trial. *Australian Journal of Physiotherapy, 53*, 75-81.

Brusco, N. K., Watts, J. J., Shields, N., & Taylor, N. F. (2014). Are weekend inpatient rehabilitation services value for money? An economic evaluation alongside a randomized controlled trial with a 30 day follow up. *BMC Medicine, 12*(1), 89-99.

Brusco, N. K., Watts, J. J., Shields, N., & Taylor, N. F. (2015). Is cost effectiveness sustained after weekend inpatient rehabilitation? 12 month follow up from a randomized controlled trial. *BMC Health Services Research, 15*(1), 165-180.

Cameron , A. C., & Trivedi, P. K. (2009). *Microeconometrics using Stata*. Texas: Stata Press.

Cameron, I. D., Lyle, D. M., & Quine, S. (1993). Accelerated rehabilitation after proximal femoral fracture: a randomized controlled trial. *Disability & Rehabilitation, 15*(1), 29-34.

Campbell, L., Bunston, R., Colangelo, S., Kim, D., Nargi, J., Hill, K., & Brooks, D. (2010). The provision of weekend physiotherapy services in tertiary-care hospitals in Canada. *Physiotherapy Canada, 62*, 347-354.

CDC. (2007). *Types of evaluation*. (CS249668). USA: Centers for disease control and prevention.

Centers for Medicare & Medicaid Services. (2012). *Inpatient rehabilitation therapy services: complying with documentation requirements*. America.

Cheung, W.-H., Shen, W.-Y., Dai, D. L.-K., Lee, K. B., Zhu, T. Y., Wong, R. M.-Y., & Leung, K.-S. (2018). Evaluation of a multidisciplinary rehabilitation programme for elderly patients with hip fracture: a prospective cohort study. *Journal of Rehabilitation Medicine, 50*, 285-291.

Chondur, R., Li, S. Q., Guthridge, S., & Lawton, P. (2014). Does relative remoteness affect chronic disease outcomes? Geographic variation in chronic disease mortality in Australia, 2002–2006. *Australian and New Zealand Journal of Public Health, 38*(2), 117-121.

Chudyk, A. M., Jutai, J. W., Petrella, R. J., & Speechley, M. (2009). Systematic review of hip fracture rehabilitation practices in the elderly. *Archives of Physical Medicine and Rehabilitation, 90*, 246-262.

Clarke, A., & Rosen, R. (2001). Length of stay: how short should hospital care be? *European Journal of Public Health, 11*(2), 166-170.

Consultative Committee on Private Rehabilitation. (2016). *Guidelines for recognition of private hospital-based rehabilitation services*. Australia: Consultative Committee on Private Rehabilitation.

Cook, C., Heath, F., & Thompson, R. L. (2000). A meta-analysis of response rates in web- or internet-based surveys. *Educational and Psychological Measurement, 60*(6), 821-836.

Curran, G. M., Bauer, M., Mittman, B., Pyne, J. M., & Stetler, C. (2012). Effectiveness-implementation hybrid designs: combining elements of clinical effectiveness and implementation research to enhance public health impact. *Medical Care*, 50(3), 217-226.

Davidson, I., Hillier, V. F., Waters, K., Walton, T., & Booth, J. (2005). A study to assess the effect of nursing interventions at the weekend for people with stroke. *Clinical Rehabilitation*, 19, 126-137.

Deloitte Access Economics. (2013). *The economic impact of stroke in Australia*. Australia: Deloitte Access Economics.

Deloitte Access Economics. (2015). *Living with Parkinson's Disease: an updated economic analysis 2014*. Australia: Deloitte Access Economics.

Devroey, M., Buyse, C., Norrenberg, M., Ros, A.-M., & Vincent, J.-L. (2016). Cardiorespiratory Physiotherapy around the Clock: Experience at a University Hospital. *Physiotherapy Canada, 68*(3), 254-258.

DiSotto-Monastero, M., Chen, X., Fisch, S., Donaghy, S., & Gomez, M. (2012). Efficacy of 7 day per week inpatient admissions and rehabilitation therapy. *Archives of Physical Medicine and Rehabilitation, 93*(12), 2165-2169.

Donaldson, A., & Finch, C. F. (2012). Planning for implmenation and translation: seek first to understand the end-user's perspective. *British Journal of Sports Medicine, 46*(5), 306-307.

Drummond, M. F., Sculpher, M. J., Claxton, K., Stoddart, G. L., & Torrance, G. W. (2015). *Methods for the economic evaluation of health care programmes*: Oxford university press.

Duncan, P. W., Weiner, D. K., Chandler, J., & Studenski, S. (1990). Functional reach: a new clinical measure of balance. *Journal of Gerontology, 45*(6), 192-197.

Earnest, A., Chen, M. I. C., & Seow, E. (2006). Exploring if day and time of admission is associated with average length of stay among inpatients from a tertiary hospital in Singapore: an analytic study based on routine admission data. *BMC Health Services Research, 6*(6).

Eng, X., Brauer, S. G., Kuys, S. S., Lord, M., & Hayward, K. S. (2014). Factors affecting the ability of the stroke survivor to drive their own recovery outside of therapy during inpatient stroke rehabilitation. *Stroke Research and Treatment, 2014*, 176-183.

English, C., Bernhardt, J., Crotty, M., Esterman, A., Segal, L., & Hillier, S. (2015). Circuit class therapy or seven-day week therapy for increasing rehabilitation intensity of therapy after stroke (CIRCIT): a randomized controlled trial. *International Journal of Stroke, 10*, 594-602.

English, C., Bernhardt, J., & Hillier, S. (2014). Circuit class therapy and 7-day-week therapy increases physiotherapy time, but not patient activity: early results from the CIRCIT trial. *Stroke, 45*, 3002-3007.

English, C., & Hillier, S. (2011). Circuit class therapy for improving mobility after stroke: a systematic review. *Journal of Rehabilitation Medicine, 43*, 565-571.

English, C., Hillier, S., Kaur, G., & Hundertmark, L. (2014). People with stroke spend more time in active task practice, but similar time in walking practice, when physiotherapy rehabilitation is provided in circuit classes compared to individual therapy sessions: an observational study. *Journal of Physiotherapy, 60*, 50-54.

English, C., & Hillier, S. (2010). Circuit class therapy for improving mobility after stroke *Cochrane Database of Systematic Reviews*(7). doi:10.1002/14651858.CD00753.pub2

English, C., Hillier, S. L., Stiller, K. R., & Warden-Flood, A. (2007). Circuit class therapy versus individual physiotherapy sessions during inpatient stroke rehabilitation: a controlled trial. *Archives of Physical Medicine and Rehabilitation, 88*, 955-963.

English, C., Shields, N., Brusco, N. K., Taylor, N. F., Watts, J. J., Peiris, C., . . . Hillier, S. (2016). Additional weekend therapy may reduce length of rehabilitation stay after stroke: a meta-analysis of individual patient data. *Journal of Physiotherapy, 62*(3), 124-129.

Foley, N., McClure, J. A., Meyer, M., Salter, K., Bureau, Y., & Teasell, R. (2012). Inpatient rehabilitation following stroke: amount of therapy received and associations with functional recovery. *Disability & Rehabilitation, 34*(25), 2132-2138.

Foley, N., Salter, K., & Teasell, R. (2007). Specialized stroke services: a meta-analysis comparing three models of care. *Cerebrovascular Diseases, 23*, 194-202.

Fontaine, P., Jacques, J., Gillian, D., Sermeus, W., Kolh, P., & Gillet, P. (2011). Assessing the causes inducing lengthening of hospital stays by means of the Appropriateness Evaluation Protocol. *Health Policy, 99*, 66-71.

Ford, I., & Norrie, J. (2016). Pragmatic Trials. *New England Journal of Medicine, 375,* 454-463.

Galvin, R., Cusack, T., & Stokes, E. (2009). Physiotherapy after stroke in Ireland: a qualitative insight into the patients' and physiotherapists' experience. *International Journal of Rehabilitation Research, 32,* 238-244.

Galvin, R., Cusack, T., O'Grady, E., Murphy, T., B,, & Stokes, E. (2011). Family-mediated exercise intervention (FAME) evaluation of a novel form of exercise delivery after stroke. *Stroke*, 42, 681-686.

Gill, S. D., Dunning, T., McKinnon, F., Cook, D., & Bourke, J. (2014). Understanding the experience of inpatient rehabilitation: insights into patient-centred care from patients and family members. *Scandinavian Journal of Caring Sciences, 28*, 264-272.

Glasgow, R. E., Lichtenstein, E., & Marcus, A. C. (2003). Why don't we see more translation of health promotion research to practice? Rethinking the efficacy-to-effectiveness transition. *American Journal of Public Health*, 93, 1261-1267.

Goncalves-Bradley, D. C., Lannin, N. A., Clemson, L. M., Cameron, I. D., & Shepperd, S. (2016). Discharge planning from hospital. *Cochrane Database of Systematic Reviews*(1). doi:10.1002/14651858.CD000313.pub.5.

Gough, S., & Doherty, J. (2007). Emergency on-call duty preparation and education for newly qualified physiotherapists: a national survey. *93*, 37-44.

Granger, C. V., Markello, S. J., Graham, J. E., Deutsch, A., & Ottenbacher, K. J. (2009). The uniform data system for medical rehabilitation: report of patients with stroke diagnosed from comprehensive medical programs in 2000-2007. *American Journal of Physical Medicine and Rehabilitation, 88*, 961-972.

Granger, C. V., Markello, S. J., Graham, J. E., Deutsch, A., Reistetter, T. A., & Ottenbacher, K. J. (2010a). The uniform data system for medical rehabilitation: report of patient with lower limb joint replacement discharged from rehabilitation programs in 2000-2007. *American Journal of Physical Medicine and Rehabilitation, 89*, 781-794.

Granger, C. V., Markello, S. J., Graham, J. E., Deutsch, A., Reistetter, T. A., & Ottenbacher, K. J. (2010b). The uniform data system for medical rehabilitation: report of patients with traumatic brain injury discharged from rehabilitation programs in 2000-2007. *American Journal of Physical Medicine and Rehabilitation, 89*, 265-278.

Granger, C. V., Reistetter, T. A., Graham, J. E., Deutsch, A., Markello, S. J., Niewczyk, P., & Ottenbacher, K. J. (2011). The uniform data system for medical rehabilitation: report of patients with hip fracture discharged from comprehensive medical programs in 2000-2007. *American Journal of Physical Medicine and Rehabilitation, 90*, 177-189.

Haines, T., Kuys, S. S., Morrison, G., Clarke, J., Bew, P., & McPhail, S. (2007). Development and validation of the balance outcome measure for elder rehabilitation. *Archives of Physical Medicine and Rehabilitation, 88*, 1614-1621.

Hakkennes, S., Lindner, C., & Reid, J. (2015). Implementing an inpatient rehabilitation Saturday service is associated with improve patient outcomes and facilitates patient flow across the health care continuum. *Disability & Rehabilitation, 37*(8), 721-727.

Halbert, J., Crotty, M., Whitehead, C., Cameron, I., Kurrle, S., Graham, S., . . . Shanahan, M. (2007). Multi-disciplinary rehabilitation after hip fracture is associated with improved outcome: a systematic review. *Journal of Rehabilitation Medicine, 39*, 507-512.

Harris, J. E., Eng, J. J., Miller, W. C., & Dawson, A. S. (2009). A self-administered graded repetitive arm supplementary program (GRASP) improves arm function during inpatient stroke rehabilitation. *Stroke*, 40, 2123-2128.

Harrison, M. L., Graff, L. A., Roos, N. P., & Brownell, M. D. (1995). Discharging patients earlier from Winnipeg hospitals: does it adversely affect quality of care? *Canadian Medical Association journal, 153*(6), 745-751.

Hartley, P., Adamson, J., Cunningham, C., Embleton, G., & Romero-Ortuno, R. (2016). Higher physiotherapy frequency is associated with shorter length of stay and greater functional recovery in hospitalized frail older adults: a restrospective observational study. *The Journal of Frailty and Aging, 5*(2), 121-125.

Hauer, K., Specht, N., Schuler, M., Bartsch, P., & Oster, P. (2002). Intensive physical training in geriatric patients after severe falls and hip surgery. *Age and Ageing, 31*, 49-57.

Hayward, K. S., Aitken, P. D., Barker, R. N., & Brauer, S. G. (2014). Admission to and continuation of inpatient stroke rehabilitation in Queensland, Australia: a survey of factors that contribute to the consultant's decision. *Brain Impairment, 15*(2), 88-98.

Hayward, K. S., & Brauer, S. G. (2015). Dose of arm activity training during acute and subacute rehabilitation post stroke: a systematic review of the literature. *Clinical Rehabilitation, 29*(12), 1234 –1243.

Hayward, K. S., Kuys, S. S., Barker, R. N., & Brauer, S. G. (2014). Clinically important improvements in motor function are achievable during inpatient rehabilitation by stroke patients with severe motor disability: A prospective observational study. *NeuroRehabilitation, 34*, 773-779.

Heart and Stroke Foundation. (2018). Canadian stroke best practices. Retrieved from http://www.strokebestpractices.ca on 21/04/2018.

Heck, C. S., Newton, J., & Chan, A. (2001). Weekend physiotherapy service provision: a survey of Toronto area hospitals. *Physiotherapy Canada, 53*, 288-297.

Heinemann, A. H., Linacre, J. M., Wright, B. D., Hamilton, B. B., & Granger, C. (1994). Prediction of Rehabilitation Outcomes with Disability Measures. *Archives of Physical Medicine and Rehabilitation, 75,* 133-143.

HERC. (2016). Cost-effectiveness analysis. Retrieved from https://www.herc.research.va.gov/include/page.asp?id=cost-effectiveness-analysis on 16/04/2018

Herdman, M., Gudex, C., Janssen, M. F., Kind, P., Bonsel, G., Badia, X., . . . Parkin, D. (2011). Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Quality of Life Research, 20*, 1727-1736.

Hill, K., Bernhardt, J., McGann, A. M., Maltese, D., & Berkovits, D. (1996). A new test of dynamic standing balance for stroke patients. *Physiotherapy Canada, Fall*, 257-262.

Hill, K., & Brooks, D. (2010). A description of weekend physiotherapy services in three tertiary hospitals in the greater toronto area. *Physiotherapy Canada, 62*(2), 155-162.

Holden, M. K., & Daniele, C. A. (1987). Comparison of seven- and five-day physical therapy coverage in patients with acute orthopaedic disorders. *Physical Therapy, 67*(8), 1240-1246.

Hong, S., Goh, E. Y., Chua, S. Y., & Hg, S. S. (2012). Reliability and validity of step test scores in subjects with chronic stroke. *Archives of Physical Medicine and Rehabilitation, 93*(6), 1065-1071.

Hooper, P. J., & Dijkers, M. (1987). Weekend therapy in rehab hospitals: a survey of costs and benefits. *Clinical Management in Physical Therapy, 7*, 16-21.

Hughes, K., Kuffner, L., & Dean, B. (1993). Effect of weekend physical therapy treatment on postoperative length of stay following total hip and total knee arthroplasty. *Physiotherapy Canada, 45*(4), 245-249.

IHPA. (2018) Activity Based Funding. Australia: Independent Hospital Pricing Authority. Retrieved from https://www.ihpa.gov.au/what-we-do/activity-based-funding on 15/04/2018.

IHPA. (2015). *National hospital cost data collection: Australian public hospitals cost report 2013-2014 round 18*. Australia: Independent Hospital Pricing Authority.

Isles, R. C., Low Choy, N. L., Steer, M., & Nitz, J. C. (2004). Normal values of balance tests in women aged 20-80. *Journal of the American Geriatrics Society, 52*, 1367-1372.

Janssen, H., Ada, L., Bernhardt, J., McElduff, P., Pollack, M., Nilsson, M., & Spratt, N. (2014). Physical, cognitive and social activity levels of stroke patients undergoing rehabilitation within a mixed rehabilitation unit. *Clinical Rehabilitation, 28*(1), 91-101.

Janssen, H., Ada, A., Bernhardt, B., McElduff, P., Pollack, M., Nilsson, M., & Spratt, N. J. (2014). An enriched environment increases activity in stroke patients undergoing rehabilitation in a mixed rehabilitation unit: a pilot non-randomized controlled trial. *Disability and Rehabilitation*, 36(3), 255-262.

Kaur, G., English, C., & Hillier, S. (2012). How physically active are people with stroke in physiotherapy sessions aimed at improving motor function? a systematic review. *Stroke Research and Treatment, 2012*, 9 pages.

Kimmel, L. A., Liew, S. M., Sayer, J. M., & Holland, A. E. (2016). HIP4Hips (high intensity physiotherapy for hip fractures in the acute hospital setting): a randomised controlled trial. *The Medical Journal of Australia, 205*(2), 73-78.

Kleim, J. A., & Jones, T. A. (2008). Principles of experience-dependent neural plasticity: implications for rehabilitation after brain damage. *Journal of Speech, Language and Hearing Research, 51*, S225-S239.

Kotter, J. P., & Schlesinger, L. A. (2008). Choosing strategies for change. *Harvard Business Review, 86*(7/8), 130-139.

Kronborg, L., Bandholm, T., Palm, H., Kehlet, H., & Kristensen, M. T. (2016). Physical activity in the acute ward following hip fracture surgery is associated with less fear of falling. *Journal of Aging and Physical Activity, 24*(4), 525-32.

Kuys, S. S., Brauer, S., & Ada, L. (2006). Routine physiotherapy does not induce a cardiorespiratory training effect post-stroke, regardless of walking ability. *Physiotherapy Research International, 11*(4), 219-227.

Kuys, S. S., Burgess, K., Fleming, J., Varghese, P., & McPhail, S. M. (2016). Evidence of improved efficiency in functional gains during subacute inpatient rehabilitation. *American Journal of Physical Medicine and Rehabilitation, 95*(11), 800-808.

Kuys, S. S., Donovan, J., Mattin, S., & Low Choy, N. L. (2015). Balance self-efficacy in older adults following inpatient rehabilitation. *International Journal of Rehabilitation Research, 38*, 167-172.

Kwakkel, G., van Peppen, R., Wagenaar, R. C., Dauphinee, S. W., Richards, C., Ashburn, A., . . . Langhorne, P. (2004). Effects of augmented exercise therapy time after stroke: a meta-analysis. *Stroke, 35*, 2529-2539.

Lang, C. E. (1998). Comparison of 6- and 7-day physical therapy coverage on length of stay and discharge outcome for individuals with total hip and knee arthroplasty. *Journal of Orthopaedic and Sports Physical Therapy, 28*(1), 15-22.

Langhorne, P., & Duncan, P. (2001). Does the organization of postacute stroke care really matter? *Stroke, 32*, 268-274.

Langhorne, P., & Pollock, A. (2002). What are the components of effective stroke unit care? *Age and Ageing, 31*, 365-371.

Lohse, K. R., Lang, C. E., & Boyd, L. A. (2014). Is more better? Using metadata to explore dose-response relationships in stroke rehabilitation. *Stroke, 45*, 2053-2058.

Luker, J., Lynch, E., Bernhardsson, S., Bennett, L., & Bernhardt, J. (2015). Stroke survivors' experiences of physical rehabilitation: a systematic review of qualitative studies. *Archives of Physical Medicine and Rehabilitation, 96*(9), 1698-1708.

Magnan, R. E., Kwan, B. M., & Bryan, A. D. (2013). Effects of current physical activity on affective response to exercise: physical and social–cognitive mechanisms. *Psychology & Health, 28*(4), 418-433.

McAuley, C. (1999). Evidence-based care: determining the appropriateness of weekend physiotherapy services in an acute care tertiary hospital. *Physiotherapy Canada, 51*, 126-132.

McCluskey, A., & Cusick, A. (2002). Strategies for introducing evidence-based practice and changing clinical behaviour: a mamager's toolbox. *Australian Occupational Therapy Journal, 49*, 63-70.

McCluskey, A., Vratsistas-Curto, A., & Schurr, K. (2013). Barriers and enablers to implementing multiple stroke guideline recommendations: a qualitative study. *BioMed Central Health Services Research, 13*, 323-335.

McDonagh, M. S., Smith, D. H., & Goddard, M. (2000). Measuring appropriate use of acute beds A systematic review of methods and results. *Health Policy, 53*, 157-184.

McGlinchey, M. P., & Davenport, S. (2015). Exploring the decision-making process in the delivery of physiotherapy in a stroke unit. *Disability & Rehabilitation, 37*(14), 1277-1284.

McNaughton, H., DeJong, G., Smout, R. J., Melvin, J. L., & Brandstater, M. (2005). A comparison of stroke rehabilitation practice and outcomes between New Zealand and United States facilities. *Archives of Physical Medicine and Rehabilitation, 88*(Suppl 2), S115-S120.

Mehrholz, J., Thomas, S., & Elsner, B. (2017). Treadmill training and body weight support for walking after stroke (Review). *Cochrane Database of Systematic Reviews*(8).

Melton, H. L., & Hartline, M. D. (2010). Customer and frontline employee influence on new service development performance. *Journal of Service Research, 113*(4), 411-425.

Monticone, M., Ambrosini, E., Laurini, A., Rocca, B., & Foti, C. (2015). In-patient multidisciplinary rehabilitation for Parkinson's Disease: a randomized controlled trial. *Movement Disorders, 30*(8), 1050-1058.

Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Cooper, C., . . . Baird, J. (2014). Process evaluation in complex public health intervention studies: the need for guidance. *Journal of Epidemiology and Community Health, 68*(2), 101-102.

Moore, G. F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., . . . Baird, J. (2015). Process evaluation of complex interventions: Medical Research Council Guidelines. *British Medical Journal, 350*, h1258.

Morris, B. A., Benetti, M., Marro, H., & Rosenthal, C. K. (2010). Clinical practice guidelines for early mobilization hours after surgery. *Orthopaedic Nursing, 29*(5), 290-316.

Mudge, S., Barber, P. A., & Stott, N. S. (2009). Circuit-based rehabilitation improves gait endurance but not usual walking activity in chronic stroke: a randomized controlled trial. *Archives of Physical Medicine and Rehabilitation, 90*(12), 1989-1996.

National Stroke Foundation. (2010). *Clinical guidelines for stroke management*. Melbourne: National Stroke Foundation.

NHMRC. (2014). *Ethical considerations in quality assurance and evaluation activities*. Australia: National Health and Medical Research Council.

NHS Improvement. (2012). Equality for all: delivering safe care seven days a week. Leicester: NHS.

NICE. (2017). Parkinson's disease in adults. United Kingdom: National Institute for Health and Care Exellence.

NICE. (2018). Quality-adjusted life year (QALYS). Retrieved from https://www.nice.org.uk/glossary?letter=q on 16/04/2018.

Nijland, R., Kwakkel, G., Bakers, J., & van Wegen, E. (2011). Constraint-induced movement therapy for the upper paretic limb in acute or sub-acute stroke: a systematic review. *International Journal of Stroke, 6*, 425-433.

Novak I. (2011). Effective home programme intervention for adults: a systematic review. *Clinical Rehabilitation, 25,* 1066–85.

Ntoumenopoulos, G., & Greenwood, K. (1996). Effects of cardiothoracic physiotherapy on intrapulmonary shunt in abdominal surgical patients. *Australian Physiotherapy, 42*(4), 297-303.

OECD. (2017). *Health at a glance 2017: OECD indicators*. Paris: The Organisation for Economic Co-operation and Development.

OTA. (2015). The role of allied health assistants in supporting occupational therapy practice. Occupational Therapy Australia.

OTA (2018). "About Occupational Therapy." Retrieved 29/10/18, from http://aboutoccupationaltherapy.com.au.

Ottenbacher, K. J., Hsu, Y., Granger, C. V., & Fiedler, R. C. (1996). The reliability of the functional independence measure: a quantitative review. *Archives of Physical Medicine and Rehabilitation, 77*, 1226-1232.

Ottensmeyer, C. A., Chattha, S., Jayawardena, S., McBoyle, K., Wrong, C., Ellerton, C., . . . Brooks, D. (2012). Weekend physiotherapy practice in community hospitals in Canada. *Physiotherapy Canada, 64*(2), 178-187.

Passalent, L. A., Tyas, J. E., Jaglal, S. B., & Cott, C. A. (2011). The FIM™ as a measure of change in function after discharge from inpatient rehabilitation: a Canadian perspective. *Disability & Rehabilititation, 33*(7), 579-588.

PEDro. (2018). PEDro Scale. Retrieved from https://www.pedro.org.au/english/downloads/pedro-scale/ on 14/04/2018.

Peiris, C. L., Shields, N., Brusco, N. K., Watts, J. J., & Taylor, N. F. (2013). Additional Saturday rehabilitation improves functional independence and quality of life and reduces length of stay: a randomised controlled trial. *BMC Medicine, 11*, 198-208.

Peiris, C. L., Shields, N., Brusco, N. K., Watts, J. J., & Taylor, N. F. (2018). Additional physical therapy services reduce length of stay and improve health outcomes in people with acute and subacute conditions: an updated systematic review and meta-analysis. *Archives of Physical Medicine and Rehabilitation,* April 7.

Peiris, C. L., Taylor, N., & Shields, N. (2011). Extra physical therapy reduces patient length of stay and improves functional outcomes and quality of life in people with acute or subacute conditions: a systematic review. *Archives of Physical Medicine and Rehabilitation, 92*, 1490-1500.

Peiris, C. L., Taylor, N. F., & Shields, N. (2012a). Additional Saturday allied health services increase habitual physical activity among patients receiving inpatient rehabilitation for lower limb orthopaedic conditions: a randomised control trial. *Archives of Physical Medicine and Rehabilitation, 93*, 1365-1370.

Peiris, C. L., Taylor, N. F., & Shields, N. (2012b). Patients value patient-therapist interactions more than the amount or content of therapy during inpatient rehabilitation: a qualitative study. *Journal of Physiotherapy, 58*, 261-268.

Peiris, C. L., Taylor, N. F., & Shields, N. (2013). Patients receiving inpatient rehabilitation for lower limb orthopaedic conditions do much less physical activity than recommended in guidelines for healthy older adults: an observational study. *Journal of Physiotherapy, 59*, 39-34.

Peters, D. H., Adam, T., Alonge, O., Agyepong, I. A., & Tran, N. (2013). Implementation research: what it is and how to do it. *British Medical Journal*, 347, f6753.

Peters, D. H., Tran, N. T., & Adam, T. (2013). Implementation research in health: a practical guide. Geneva, Switzerland: World Health Organisation.

Peurala, S. H., Kantanen, M. P., Sjogren, T., Paltamaa, J., Karhula, M., & Heinonen, A. (2012). Effectiveness of constraint-induced movement therapy on activity and participation after stroke: a systematic review and meta-analysis of randomised controlled trials. *Clinical Rehabilitation, 26*(3), 209-223.

Pinnock, H., Barwick, M., Eldridge, S., Carpenter, C. R., Grandes, G., Taylor, S. J. C., . . . Sheikh, A. (2017). Standards for reporting implementation studies (StaRI) statement. *British Journal of Medicine*, 356.

Podsiadlo, D., & Richardson, S. (1991). The Timed 'Up & Go': a test of basic functional mobility for frail elderly persons. *Journal of American Geriatrics Society, 39*, 142-148.

Porter, S. R. (2004). Raising response rates: What works? *New Directions for Institutional Research, 121*, 5-21.

Proctor, E., Silmere, H., Hovmand, P., Aarons, G., Griffey, R., Raghavan, R., . . . Hensley, M. (2011). Outcomes for implementation research: conceptual distinctions, measurement challenges,

and research agenda. *Administration and Policy in Mental Health and Mental Health Services Research*, 38, 65-76.

Pua, Y.-H., Ong, P.-H., Chong, H.-C., & Lo, N.-N. (2011). Sunday physiotherapy reduces inpatient stay in knee arthroplasty: a retrospective cohort study. *Archives of Physical Medicine and Rehabilitation, 92*, 880-885.

Pua, Y.-H., Seah, F. J.-T., Poon, C. L.-L., Tan, J. W.-M., Liaw, J. S.-C., & Chong, H.-C. (2016). Association between rehabilitation attendance and physical function following discharge after total knee arthroplasty: prospective cohort study. *Osteoarthritis and Cartilage*.

Putman, K., De Wit, L., Schupp, W., Beyens, H., Dejaeger, E., De Weerdt, W., . . . Leys, M. (2007). Inpatient stroke rehabilitaiton: a comparative study of admission criteria to stroke rehabilitation units in four European centres. *Journal of Rehabilitation Medicine, 39*, 21-26.

Rapoport, J., & Judd-VanEerd, M. (1989). Impact of physical therapy weekend coverage on length of stay in an acute care community hospital. *Physical Therapy, 69*(1), 32-37.

Reistetter, T. A., Graham, J. E., Deutsch, A., Granger, C. V., Markello, S., & Ottenbacher, K. J. (2010). Utility of functional status for classifying community versus institutional discharges after inpatient rehabilitation for stroke. *Archives of Physical Medicine and Rehabilitation, 91*, 345-350.

Robert, G., Cornwell, J., Locock, L., Purushotham, A., Sturmey, G., & Gager, M. (2015). Patients and staff as codesigners of healthcare services. *The BMJ*, 350, g7714.

Robinson, A. J., Turner DePalma, M., & McCall, M. (1995). Physical therapist assistants' perceptions of the documented roles of the physical therapist assistant. *Physical Therapy*, 75(12), 22-32.

Ruff, R. M., Yarnell, S., & Marinos, J. M. (1999). Are stroke patients discharged sooner if in-patient rehabilitation services are provided seven v six days per week? *American Journal of Physical Medicine and Rehabilitation, 78*(2), 143-146.

Sarkies, M. N., White, J., Henderson, K., Haas, R., Bowles, J., & Evidence Translation in Allied Health (EviTAH) Group. (2018). Additional weekend allied health services reduce length of stay in subacute rehabilitation wards but their effectiveness and cost-effectiveness are unclear in acute general medical and surgical hospital wards: a systematic review. Journal of Physiotherapy, 64, 142-158.

Sarkies, M. N., White, J., Morris, M. E., Taylor, N. F., Willians, C., O'Brien, L., . . . Haines, T. P. (2018). Implementation of evidence-based weekend service recommendations for allied

health managers: a cluster randomised controlled trial protocol. *Implementation Science, 13*(60).

SARRAH. (2018). Demography and Population. Retrieved from https://www.sarrah.org.au/content/demography-and-population on 10/05/2018.

Schmidt, W., Taeger, D., Buecker-Nott, H., & Berger, K. (2003). The impact of the day of the week and month of admission on the length of hospital stay in stroke patients. *Cerebrovascular Diseases, 16*, 247-252.

Schneider, E. J., Lannin, N. A., Ada, L., & Schmidt, J. (2016). Increasing the amount of usual rehabilitation improves activity after stroke: a systematic review. *Journal of Physiotherapy, 62*, 182-187.

Scrivener, K., Jones, T., Schurr, K., Graham, P. L., & Dean, C. M. (2015). After-hours or weekend rehabilitation improves outcomes and increases physical activity but does not affect length of stay: a systematic review. *Journal of Physiotherapy, 61*, 61-67.

Sehatzadeh, S. (2015). Effect of increased intensity of physiotherapy on patient outcomes after stroke: an evidence-based analysis *Ontario Health Technology Assessment Series, 15*(6), 1-42.

Shaw, K. D., Taylor, N. F., & Brusco, N. K. (2013). Physiotherapy services provided outside of business hours in Australian hospitals: a national survey. *Physiotherapy Research International, 18*, 115-123.

Shee, A.W., Phillips, B., Hill, K., & Dodd, K. (2014). Feasibility and acceptability of a volunteer-mediated diversional therapy program for older patients with cognitive impairment. *Geriatric Nursing, 35*, 300-305.

Sherrington, C., Pamphlett, P. I., Jacka, J. A., Olivetti, L. M., Nugent, J. A., Hall, J. M., . . . Lord, S. R. (2008). Group exercise can improve participants' mobility in an outpatient rehabilitation setting: a randomized controlled trial. *Clinical Rehabilitation, 22*, 493-502.

Shumway-Cook, A., & Horak, F. B. (1986). Assessing the influence of sensory interaction on balance. *Physical Therapy, 66*(10), 1548-1550.

Slade, A., Tennant, A., & Chamberlain, M. A. (2002). A randomised controlled trial to determine the effect of intensity of therapy upon length of stay in a neurological rehabilitation setting. *Journal of Rehabilitation Medicine, 34*, 260-266.

Slote Morris, Z., Wooding, S., & Grant, J. (2011). The answer is 17 years, what is the question: understanding time lags in translational research. *Journal of the Royal Society of Medicine, 104*, 510-520.

State Government of Victoria. (2012). Supervision and delegation framework for allied health assistants. Melbourne: State Government of Victoria.

Steffen, T. M., Hacker, T. A., & Mollinger, L. (2002). Age-and gender-related test performance in community-dwelling elderly people: six-minute walk test, berg balance scale, timed up and go test, and gait speeds. *Physical Therapy, 82*(2), 128-137.

Stroke Foundation. (2017). *Clinical Guidelines for Stroke Management 2017*. Melbourne, Australia.

Stroke Unit Trialists' Collaboration. (2013). Organised inpatient (stroke unit) care for stroke. *Cochrane Database of Systematic Reviews*(9).

Taraldsen, K., Sletvold, O., Thingstad, P., Lydersen, S., & Helbostad, J. L. (2014). Physical behavior and function early after hip fracture surgery in patients receiving comprehensive geriatric care or orthopedic care - a randomized controlled trial. *The journals of gerontology. Series A, Biological sciences and medical sciences, 69*(3), 338–345.

Teng, T.-H. K., Katzenellenbogen, J. M., Hung, J., Knuiman, M., Sanfilippo, F. M., Geelhoed, E., . . . Thompson, S. C. (2014). Rural–urban differentials in 30-day and 1-year mortality following first-ever heart failure hospitalisation in Western Australia: a population-based study using data linkage. *British Medical Journal Open, 4*, e004724.

The Treasury. (2010). *Australia to 2050: future challenges*. Canberra: Australian Government.

Treacy, D., Schurr, K., Lloyd, B., & Sherrington, C. (2015). Additional standing balance circuit classes during inpatient rehabilitation improved balance outcomes: an assessor-blinded randomised controlled trial. *Age and Ageing, 44*, 580-586.

Tyson, S., & Connell, L. (2009). The psychometric properties and clinical utility of measurs of walking and mobility in neurological conditions: a systematic review. *Clinical Rehabilitation, 23*, 1018-1033.

Valentin, A., Ferdinande, P., & ESICM Working Group on Quality Improvement. (2011). Recommendations on basic requirements for intensive care units: structural and organizational aspects. *Intensive Care Medicine, 37, 10*, 1575-1587.

van de Port, I. G. L., Wevers, L. E. G., Lindeman, E., & Kwakkel, G. (2012). Effects of circuit training as alternative to usual physiotherapy after stroke: randomised controlled trial. *British Medical Journal, 344*(7859), 16.

van der Peijl, I. D., Vliet Vlieland, T. P. M., Versteegh, M. I. M., Lok, J. J., Munneke, M., & Dion, R. A. E. (2004). Exercise therapy after coronary artery bypass graft surgery: a randomised comparison of a high and low frequency exercise therapy program. *The Annals of Thoracic Surgery, 77*, 1535-1541.

Vearrier, L. A., Langan, J., Shumway-Cook, A., & Woollacott, M. H. (2005). An intensive massed practice approach to retraining balance post-stroke. *Gait and Posture, 22*, 154-63.

Veerbeek, J. M., Koolstra, M., Ket, J. C. F., van Wegen, E. E. H., & Kwakkel, G. (2011). Effects of augmented exercise therapy on outcome of gait and gait-related activities in the first 6 months after stroke: a meta-analysis. *Stroke, 42*, 3311-3315.

Victorian Auditor-General's Office. (2008). *Victorian Auditor-General's report: managing acute patient flows*. Australia: Victorian Auditor-General's Office.

Waddell, D., & Sohal, A. S. (1998). Resistance: a constructive tool for change management. *Management Decision, 36*(8), 543-548.

Waddell, K. J., Birkenmeier, R. L., Moore, J. L., Hornby, T. G., & Lang, C. E. (2014). Feasibility of high-repetition, task-specific training for individuals with upper-extremity paresis. *The American Journal of Occupational Therapy, 68*(4), 444-453.

WCPT. (2016). What is physical therapy? Retrieved from http://www.wcpt.org/what-is-physical-therapy on 22/11/2016.

Wells, K. B. (1999). Treatment research at the crossroads: the scientific interface of clinical trials and effectiveness research. *American Journal of Psychiatry*, 156, 5-10.

West, T., & Bernhardt, J. (2012). Physical activity in hospitalised stroke patients. *Stroke Research and Treatment, 2012*, 13 pages.

White, J. H., Bartley, E., Janssen, H., Jordan, L.-A., & Spratt, N. (2015). Exploring stroke survivor experience of participation in an enriched environment: a qualitative study. *Disability and Rehabilitation*, 37(7), 593-600.

WHO. (2011). *World report on disability*. Geneva: World Health Organisation.

WHO. (2015). *World report on ageing and health.* Geneva: World Health Organisation.

Winther, S. B., Foss, O. A., Wik, T. S., Davis, S. P., Engdal, M., Jessen, V., & Husby, O. S. (2015). 1-year follow-up of 920 hip and knee arthroplasty patients after implementing fast-track: good outcomes in a Norwegian university hospital. *Acta Orthopaedica, 86*(1), 78-85.

Wolf, S. L., Catlin, P. A., Gage, K., Gurucharri, K., Robertson, R., & Stephen, K. (1999). Establishing the reliability and validity of measurements of walking time using the Emory Functional Ambulation Profile. *Physical Therapy, 79*, 1122-1133.

Yang, Y., Lee, P. K. C., & Cheng, T. C. E. (2016). Continuous improvement competence, employee creativity, and new service development performance: a frontling employee perspective. *International Journal of Production Economics, 171*, 275-288.

Yu, X. Q., Luo, Q., Smith, D. P., O'Connell, D. L., & Baade, P. D. (2014). Geographic variation in prostate cancer survival in New South Wales. *The Medical Journal of Australia, 200*(10), 586-590.

Appendices

Appendix 1 – Ethical approval documents – for Erin Caruana (née Stanley)

THE UNIVERSITY OF QUEENSLAND

Institutional Human Research Ethics Approval

Project Title:	Investigation Of The Impact Of A Saturday Inpatient Rehabilitation Physiotherapy Service On Patient Outcomes And Length Of Stay
Chief Investigator:	Ms Erin Caruana
Supervisor:	Prof Sandra Brauer
Co-Investigator(s):	Jane Clarke
School(s):	School of Health & Rehabilitation Sciences
Approval Number:	2014000752
Granting Agency/Degree:	MPhil
Duration:	30th June 2015

Comments/Conditions:

Expedited review on the basis of approval from the UnitingCare Health HREC dated 13/07/2011, 14/03/2013 & 20/12/2013, and the St Andrew's Medical Institute Research Committee dated 18/07/2011

Note: if this approval is for amendments to an already approved protocol for which a UQ Clinical Trials Protection/Insurance Form was originally submitted, then the researchers must directly notify the UQ Insurance Office of any changes to that Form and Participant Information Sheets & Consent Forms as a result of the amendments, before action.

Name of responsible Committee:
Medical Research Ethics Committee
This project complies with the provisions contained in the *National Statement on Ethical Conduct in Human Research* and complies with the regulations governing experimentation on humans.

Name of Ethics Committee representative:
Professor Bill Vicenzino
Chairperson
Medical Research Ethics Committee

Signature _____ Date 5 JUN 2014

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

School of Health and Rehabilitation Sciences
Head of School
Professor Louise Hickson
BSpThy(Hons), MAud, PhD

CRICOS PROVIDER NUMBER 00025B

30th November 2015

Erin Caruana
MPhil Candidate
Physiotherapy

erinlouisecaruana@gmail.com

Dear Erin

Re: **Ethics application #2015SHRSPHTY001:**
Title: Survey of weekend therapy services and staff perceptions in rehabilitation facilities in Australia.
Principal Investigator: Erin Caruana
Supervisors: Prof Sandy Brauer, Prof Suzanne Kuys, and Jane Clarke

I am pleased to advise that your project has been reviewed and cleared within the School of Health and Rehabilitation Sciences in accordance with the ethical review guidelines and processes of the University of Queensland, with the following conditions:

1. Change the ethical clearance paragraph to more appropriately reflect the level of ethical clearance to:

This project has been cleared in accordance with the ethical review guidelines and processes of the University of Queensland. These guidelines are endorsed by the University's principal human ethics committee, the Human Experimentation Ethical Review Committee and registered with the Australian Health Ethics Committee as complying with the National Statement. You are free to discuss your participation in this study with project staff listed on this document. If you would like to speak to an officer of the University not involved in the study, you may contact the Chair of the Research and Postgraduate Studies Committee, School of Health and Rehabilitation Sciences through the Executive Assistant on (07) 3365 7139.

2. Attend to some minor suggested revisions in your survey (highlighted in attached).

Sincerely,

Professor Bill Vicenzino
Ethics Officer: SHRS: Physiotherapy
e-mail: b.vicenzino@uq.edu.au
phone: 0409 267 247

UnitingCare Health

Human Research Ethics Committee

Ground Floor Moorlands House, The Wesley Hospital
451 Coronation Drive, Auchenflower Q 4066

PO Box 499 Toowong Q 4066
Phone: 3232 7500 Facsimile: 3232 6253
Email: ethics@uchealth.com.au

Document Submission and Approval Form

Please quote our reference: 2011.16.38

Correspondence: from Erin Stanley dated 11th July 2011

Study Title: *Investigation of the impact of a Saturday inpatient rehabilitation physiotherapy service on patient outcomes and length of stay*

Investigator: Erin Stanley and Jane Clark of St Andrew's Hospital

Details of documents reviewed:

- Application to conduct abovenamed research at St Andrew's Hospital

The document/s listed above were received, reviewed and approved.

Douglas Killer MBBS FRACP
Executive Officer

13th July 2011

St Andrew's War Memorial Hospital
457 Wickham Terrace, Brisbane
GPO Box 764 Brisbane
QLD 4001 Australia
Phone: (07) 3834 4245
Fax: (07) 3834 4336

24 January 2011

Dear Sir/Madam,

St Andrew's War Memorial Hospital
Physiotherapy Weekend Rehabilitation Service Survey

St Andrew's War Memorial Hospital is working towards trialling a six day Physiotherapy service in its Rehabilitation ward. Currently St Andrew's War Memorial Hospital provides a seven day Physiotherapy service on the acute wards, but no extended hours of Physiotherapy are provided in the Rehabilitation ward. To assist us in implementing our weekend service, we would appreciate if you could fill out the following survey about the Physiotherapy and Allied Health services you provide in your Rehabilitation ward. Please return your completed surveys via email by the 7th February 2011. This information will remain confidential and only be used for the outlined purpose of setting up our service.

Thank you for your assistance with this matter. The information you provide will help us to implement an effective and comprehensive service to ensure the best treatment of our patients.

If you require any further information, please email jane.clarke@uchealth.com.au or phone (07) 3834 4245

Kind regards,

Erin Stanley and Jane Clarke
Physiotherapists

Thank you kindly for your contribution.

St Andrew's War Memorial Hospital
Physiotherapy Weekend Rehabilitation Service Survey

Name and Location of Facility:

Number of Rehabilitation Beds:

Private or Public Hospital Facility:

Type of Rehabilitation Service you provide:

- ☐ Geriatric
- ☐ Neurological
- ☐ Orthopaedic
- ☐ Spinal
- ☐ ABI
- ☐ Amputee
- ☐ General
- ☐ Other – please specify:

Number of days your Rehabilitation Service provides Allied Health Services:

- ☐ 5 days
- ☐ 6 days
- ☐ 7 days

If your facility provides an weekend Allied Health service in your Rehabilitation department, how many hours do therapists or assistants work on each day and in which disciplines?

Discipline	Number of Hours	Therapy provided (eg. group, individual)	Comments
Physiotherapy			
Occupational Therapy			
Speech Pathology			
Dietetics/Nutrition			
Social Worker			
Therapy Assistant – PT			
Therapy Assistant – OT			
Therapy Assistant – SP			
Therapy Assistant – general			

How do you roster your staff to allow for this weekend service?

- ☐ Permanent staff rostered to work additional weekend shifts
- ☐ Casual or fixed contract staff for weekend work
- ☐ Other – please specify:

Does your facility have a guideline for rostering staff for Rehabilitation weekend work?

How do you determine which patients are seen on the weekend?

What is the average number of patients treated on the weekend?

Did your facility undertake any benchmarking, literature reviews or projects prior to commencing a weekend rehabilitation service? Are you willing to share this information?

Have you found any supporting evidence that an extended weekend service has provided improved patient outcomes at your facility (e.g. outcome measures, reduced length of stay, patient satisfaction, workload management etc)?

What data do you use to determine the effectiveness of the weekend services and what have you found?

Does your hospital have an Acute Stroke Unit? If yes, how many beds does it consist of and how is it staffed over the weekend?

Thank you for your assistance in this matter. Your help has been greatly appreciated.

Kind regards,
Erin Stanley and Jane Clarke (Physiotherapists)

Appendix 2b – Staff surveys for the formative evaluation in Study 3

Appendix 2b.1 – Pre-implementation survey

St Andrew's War Memorial Hospital
457 Wickham Terrace, Brisbane
GPO Box 764 Brisbane
QLD 4001 Australia
Phone: (07) 3834 4245
Fax: (07) 3834 4336

Staff Survey Pre-Saturday Physiotherapy Rehabilitation Trial

St Andrews War Memorial Hospital Physiotherapy Department is planning a trial of a Saturday Physiotherapy service for Rehabilitation. We will allocate four hours on Saturday to treat a variety of patients, mainly those with neurological conditions or orthopaedic conditions, in the aim of decreasing length of hospital stay.

Please fill out the survey below to assist us with the implementation of our service. Your thoughts would be greatly appreciated.

Occupation:

Do you feel that extending the physiotherapy coverage for rehabilitation will help to meet patient goals sooner? Why?

Do you feel that extending the physiotherapy coverage for rehabilitation will decrease a patients length of hospital stay? Why?

What do you forsee are the barriers for implementing a rehabilitation weekend service at St Andrews War Memorial Hospital?

How do you think these problems could be managed?

What outcome measures should be used to determine the effectiveness of interventions?

What considerations should be made when allocating patients for a Saturday rehabilitation service?

What do you think is a reasonable number of rehabilitation patients to treat during this four hour period?

How do you think treatment should be provided?

- ☐ Gym
- ☐ Ward
- ☐ Group
- ☐ Individual

Comments:

Thank you for your time and input filling out this survey. Your help has been greatly appreciated.
Erin Stanley and Jane Clarke

Appendix 2b.2 – Post-implementation survey

St Andrew's War Memorial Hospital
457 Wickham Terrace, Brisbane
GPO Box 764 Brisbane
QLD 4001 Australia
Phone: (07) 3834 4245
Fax: (07) 3834 4336

Staff Survey Post-Implementation of Saturday Physiotherapy Rehabilitation Trial

St Andrews War Memorial Hospital Physiotherapy Department is currently running a Saturday Physiotherapy service for Rehabilitation. Four hours each Saturday has been allocated to treat an average of twelve patients, mainly those with neurological or orthopaedic conditions, in the aim of decreasing length of hospital stay and improving patient outcomes.

Please fill out the survey below to assist us in reviewing the implementation of this service. Your thoughts would be greatly appreciated.

Occupation:

Do you feel that extending the physiotherapy coverage to a Saturday service in rehabilitation helped to meet patient goals sooner? How so?

Do you feel that extending the physiotherapy coverage for rehabilitation aided in decreasing patients length of hospital stay? Why?

Did you experience any problems in the implementation of this initiative?

How do you think these problems could have been better managed?

If you participated in running this service, what worked well, and what could be improved?

Was the allocation of patients for Saturday Physiotherapy appropriate? If not, how could this be managed better?

How could this service be improved?

Any other comments?

Thank you for your time and input filling out this survey. Your help has been greatly appreciated.

Erin Stanley and Jane Clarke

Appendix 2b.3 – Post-modification survey

(Please note only Section A was used in Study 3)

St Andrew's War Memorial Hospital
457 Wickham Terrace, Brisbane
GPO Box 764 Brisbane
QLD 4001 Australia
Phone: (07) 3834 4245
Fax: (07) 3834 4336

10th September 2013

Rehabilitation Weekend Physiotherapy Survey

St Andrew's War Memorial Hospital has been running a Saturday Physiotherapy Service in the Rehabilitation Unit since 2011. This service has been put in place with the view of reducing patient length of stay and improving Physiotherapy outcomes to help patients achieve their rehabilitation goals sooner. This service was run as part of the Physiotherapy Acute weekend service in 2011, and then changed in 2012 to be run by Rehabilitation Physiotherapists as a separate 4 hour service. A research project is currently underway, investigating and evaluating this service and its benefit to the patients of the Rehabilitation ward.

Part of this research project involves a staff survey evaluating the Saturday Rehabilitation Physiotherapy Service. Surveys have already been completed in 2011 evaluating the introduction of a Saturday Physiotherapy Service. This survey aims to:

1. evaluate the service being run by Rehabilitation Physiotherapists on the 30 bed Rehabilitation ward
2. evaluate the current service in place with the change to 20 beds, and
3. investigate what staff working in the Rehabilitation ward would like a Weekend Rehabilitation Service to consist of.

Completion of this survey is voluntary, and the results of the survey aim to be used as part of a research paper. Your responses will remain anonymous, with the only identifying feature collected being your occupation. If you are happy to complete this survey and participate in this research project, please sign your consent below. When handing in this survey, please remove this consent form and place it, and the survey in the allocated trays in the Physiotherapy Gym on Level 3.

If you require any further information, please do not hesitate to contact me by email (Erin.Caruana@uchealth.com.au) or phone 3834 4368.

_____ _____ ___ / ___ / ___

Signature Printed Name Date

Kind regards,
Erin Caruana
(Physiotherapist)

Section A: Saturday Physiotherapy 2012

The previous Saturday Physiotherapy service for the 30 bed Rehabilitation ward was a 4 hour service run from 9am to1pm with a Nursing staff member helping with porterage and assisting where necessary. The service treated approximately 14 patients.

1. Occupation:

2. Were you working in the Rehabilitation ward in 2012? ☐ Yes ☐ No

3. How satisfied were you with the previous service?

☐ Very satisfied ☐ Satisfied ☐ Neutral ☐ Dissatisfied ☐ Very dissatisfied

4. What did you think worked well with this service?

5. What did you think could be improved?

6. Do you think the Saturday Physiotherapy service outlined above aided in decreasing length of stay for rehabilitation patients? Why?

7. Do you think the Saturday Physiotherapy service outlined above helped patients to meet their rehabilitation goals sooner? Why?

8. Do you think the allocation of patients to the Saturday Physiotherapy service was appropriate?

- Comments:

Section B: Saturday Physiotherapy 2013

The service that is currently being run for the 20 bed Rehabilitation ward is a 3 to 4 hour service (depending on patient load), treating approximately half the ward, with porterage available for some of this time.

1. Have you worked in the Rehabilitation ward in 2013 since the change to 20 beds?

☐ Yes ☐ No

2. How satisfied are you with the current Saturday Physiotherapy service?

☐ Very satisfied ☐ Satisfied ☐ Neutral ☐ Dissatisfied ☐ Very dissatisfied

3. What do you think works well with this service?

4. What do you think could be improved?

5. Do you think this service will help to reduce length of stay in rehabilitation patients? Why?

6. Do you think this service will help patients meet their rehabilitation goals sooner? Why?

7. What do you think is a reasonable number of rehabilitation patients to treat during this 3 hour period? Why?

8. How do you think treatment should be provided?

- Location
  - ☐ Gym
  - ☐ Ward
- Service delivery
  - ☐ Group
  - ☐ Individual

- Comments:

Section C: Saturday Physiotherapy

With the changes of the Rehabilitation Unit to 20 beds, we are re-evaluating the weekend service to investigate Medical, Nursing and Allied Health staff members opinions of what they would like a Weekend Rehabilitation service to consist of. **Please keep in mind this is a survey for a Research project and does not always reflect what can be offered by the current staffing model.**

1. Do you think the weekend physiotherapy service should continue? Why?

2. If yes, how would you like to see the service run? Please consider

- ☐ Number of hours
- ☐ Staffing, (FTE and discipline)
- ☐ Number of patients treated

3. Why would you like the service to be run this way?

4. The current service is a priority-based service, with the following inclusion criteria for patients to be included in the Saturday Physiotherapy Rehabilitation Service:

- ☐ Those that will decline if not seen over the weekend
- ☐ Those admitted on Thursday or Friday, provided a functional assessment has been completed
- ☐ Those admitted for a short rehabilitation stay
- ☐ Those making daily gains and would benefit from further Physiotherapy input
- ☐ Those that are not heavier than 1A for mobility. Patients that require more assistance than this can still be allocated for treatment that does not consist of mobilisation

Please tick the criteria above that you agree with, and cross the criteria that you do not agree with. Are there other criteria you feel should be taken into consideration when deciding on the allocation of patients?

Thank you for your time and input filling out this survey. Your help has been greatly appreciated.

Erin Caruana

Appendix 2c – National survey used in Study 4

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Weekend Allied Health Therapy Service Provision in Rehabilitation

Welcome to the Survey

Title: Survey of Weekend Therapy Services and Staff Perceptions in Rehabilitation Units in Australia

Lay Title: Weekend Allied Health Therapy Service Provision in Australia

This survey is investigating current allied health weekend therapy service provision in rehabilitation units around Australia. For the purpose of this survey, allied health weekend therapy in rehabilitation refers to any therapy delivered on Saturday or Sunday by an allied health professional or exercises provided by a therapy assistant prescribed by an allied health professional.The information gained from this survey will be used to inform future rehabilitation weekend therapy service implementation.

The survey is expected to take approximately 15 minutes to complete. It is important that the answers accurately reflect the weekend therapy service currently provided at the rehabilitation unit where you are working. You will be asked for the name of the rehabilitation unit you work in. Please note, this is solely for the purpose of tracking responses and will be de-identified in any publication. The last page asks questions regarding your personal perception of weekend service provision in rehabilitation. Please ensure you answer these questions as honestly as possible. This allows us an understanding of how staff perceive the provision of weekend services in rehabilitation.

Each question requires an answer. For most questions you will be given the question and multiple answers, please choose the answer that best describes your situation. Several questions allow for you to choose multiple answers. Please select all that apply. If you have answered a question, but wish to change your answer, clicking once on the tick will remove it. Please navigate through the survey using the 'Next' and 'Prev' buttons at the bottom of each page. You will not be able to move forward if there is an unanswered question. If you are having trouble moving from a page, look for a red error message near each of the questions. Unfortunately you will not be able to exit this survey and return to it at a later date, so please ensure you allow adequate time to complete the survey.

By consenting to participate in this study you acknowledge that:
- this research may not be of any direct benefit to yourself
- you are free to withdraw from the survey at any stage without penalty
- the information obtained in this survey will be treated confidentially, and all surveys will be de-identified in any publication.

This project has been cleared in accordance with the ethical review guidelines and processes of the University of Queensland. These guidelines are endorsed by the University's principal human ethics committee, the Human Experimentation Ethical Review Committee and registered with the Australian Health Ethics Committee as complying with the National Statement. You are free to discuss your participation with the project staff listed on this document. If you would like to speak to an officer of the University not involved in the study, you may contact the Chair of the Research and Postgraduate Studies Committee, School of Health and Rehabilitation Sciences through the Executive Assistant on (07) 3365 7139.

1

We thank you for your participation in this survey, and your time. If you have any further questions regarding this survey, please email e.caruana@uq.edu.au.

Erin Caruana - M. Phil Candidate, Division of Physiotherapy, University of Queensland; Physiotherapist, St Andrew's War Memorial Hospital
Prof. Sandy Brauer - Division of Physiotherapy, University of Queensland
Prof. Suzanne Kuys - School of Physiotherapy, Australian Catholic University
Jane Clarke - School of Physiotherapy, Australian Catholic Univerity

*** 1. Do you consent to completing this survey?**

- ○ Yes, I have read the information provided and agree to participate in this research.
- ○ No, I do not wish to participate

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Weekend Allied Health Therapy Service Provision in Rehabilitation

2. You must provide consent to participate in this survey. If you would like to continue with this survey, please select the option below, to return to the previous page. If you wish to leave this survey without completing it, please select the option below.

- ○ Return to previous page
- ○ Leave survey

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Weekend Allied Health Therapy Service Provision in Rehabilitation

Rehabilitation Unit Demographics

3. Name of rehabilitation unit (please note, this is solely for the purpose of tracking responses and will be de-identified in any publication)

4. Which state or territory is your rehabilitation unit in?

- ACT
- QLD
- NSW
- NT
- SA
- TAS
- VIC
- WA

5. Which area is your rehabilitation unit located in?

- Metropolitan
- Regional
- Rural

6. How is your rehabilitation unit funded?

- Public
- Private
- Other (please specify)

7. How many rehabilitation beds are in your rehabilitation unit?

8. How many staff (FTE) work in your rehabilitation unit on a normal weekday (Monday to Friday)?

Physiotherapists	
Occupational Therapists	
Speech Pathologists	
Dietitians	
Social Workers	
Psychologists	
Discharge Coordinators	
Exercise physiologists	
Therapy Assistants (please specify discipline eg. PTA, OTA, AHA)	
Other (please specify)	

9. What is the diagnostic mix of your rehabilitation unit? (please answer every box)

	Patients treated at your service	Percentage of case-mix
Stroke		
ABI/TBI		
SCI		
Other Neurological		
Orthopaedic		
Amputee		
Other Trauma		
Deconditioning		

Other (please specify)

10. What is the age mix of the patients treated at your rehabilitation unit? (please answer every box)

	Patients treated at your facility	Percentage of case-mix
< 18 years		
18-45 years		
45-65 years		
> 65 years		

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Weekend Allied Health Therapy Service Provision in Rehabilitation

Weekend Allied Health Service Provision

Weekend therapy service in rehabilitation describes any therapy provided in rehabilitation over the weekend by Allied Health staff members or Therapy Assistants.

*** 11. Does your rehabilitation unit currently provide a weekend therapy service?**

- ○ Yes
- ○ No

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

Weekend Allied Health Therapy Service Provision in Rehabilitation

Weekend Allied Health Service Delivery

12. How long has your rehabilitation unit been providing a weekend therapy service?

- ○ < 1 year
- ○ 1-2 years
- ○ 3-5 years
- ○ 6-10 years
- ○ 10-15 years
- ○ > 15 years

13. When is this service provided?

	Is service provided?	What is the average length of service provided?
Saturday		
Sunday		

14. What criteria does your rehabilitation unit use to determine which patients receive weekend therapy? To be included in weekend therapy patients must... (please select all that apply)

- ☐ be making daily gains
- ☐ be likely to deteriorate
- ☐ be likely to benefit from more intensive rehabilitation
- ☐ have swallowing problems
- ☐ require discharge planning
- ☐ require carer training/home visit with family only available on weekend
- ☐ be happy to participate in weekend therapy
- ☐ be admitted for a short rehabilitation stay
- ☐ be a late week or new admission
- ☐ require an ADL assessment
- ☐ Other (please specify)
- ☐ have certain funding entitlements
- ☐ be cognitively intact
- ☐ have a stroke diagnosis
- ☐ have an Acquired/traumatic brain injury diagnosis
- ☐ have a spinal cord injury diagnosis
- ☐ have another neurological diagnosis
- ☐ have an orthopaedic diagnosis
- ☐ have a cardiorespiratory diagnosis
- ☐ all patients are seen

15. How is the weekend service at your rehabilitation unit staffed on a Saturday?

	Number of staff (FTE)	Type of staff	How is therapy provided?	Where is therapy provided?	Average number of patients treated?
Physiotherapy					
Physiotherapy Assistant					
Occupational Therapy					
Occupational Therapy Assistant					
Speech Pathology					
Speech Pathology Assistant					
Dietetics					
Social Work					
Psychology					
Discharge Coordinator					
Allied Health Assistant					

Other Disciplines (excluding medical staff) - please answer question as above

16. How is the weekend service at your rehabilitation unit staffed on a Sunday? (if no service is provided on a Sunday, please skip to next question)

	Number of staff (FTE)	Type of staff	How is therapy provided?	Where is therapy provided?	Average number of patients treated?
Physiotherapy					
Physiotherapy Assistant					
Occupational Therapy					
Occupational Therapy Assistant					
Speech Pathology					
Speech Pathology Assistant					
Dietetics					
Social Work					
Psychology					
Discharge Coordinator					
Allied Health Assistant					

Other Disciplines (excluding medical staff) - please answer question as above

17. Did your rehabilitation unit complete any research or benchmarking prior to implementing this weekend service?

- ○ Yes
- ○ No
- ○ Unsure
- ○ Please provide information on what was collected/found

18. Have you seen any benefits from the provision of this service? (please tick all that apply)

- [ ] Reduced LOS
- [ ] Faster goal attainment
- [ ] Improvemenst in FIM efficiency
- [ ] Improvements in mobility at discharge
- [ ] Improvements in balance at discharge
- [ ] Improvements in ADL attainment at discharge
- [ ] Improvements in speech and swallow ability at discharge
- [ ] Increased patient/family satisfaction
- [ ] Increased staff satisfcation
- [ ] Improvements in patient's QOL
- [ ] Reduced reporting of secondary complications
- [ ] Other (please specify)

19. What facilitators enable your rehabilitation unit to provide a weekend therapy service?

- [ ] Organisational support
- [ ] Staff support
- [ ] Medical staff support
- [ ] Evidence of outcomes
- [ ] Patient/family satisfaction
- [ ] Financial support
- [ ] Staff availability
- [ ] Porterage availability
- [ ] Proximity of therapy area to ward
- [ ] Other/further details

20. What are barriers to providing an optimal weekend therapy service at your rehabilitation unit? (please tick all that apply)

- [ ] Budgetary constraints
- [ ] Organisational support
- [ ] Lack of evidence
- [ ] Lack of benefits to patients
- [ ] Patient safety
- [ ] Patient participation/motivation
- [ ] Patient fatigue
- [ ] Interference with patient leave or visiting hours
- [ ] Family/visitor preference
- [ ] Lack of patients, or lack of appropriate patients
- [ ] Staff resistance
- [ ] Staffing availability
- [ ] Staff safety
- [ ] Other (please specify)

21. What outcomes is your rehabilitation unit using to evaluate weekend service provision?

	Is this collected as part of usual practice?	Is this collected as part of the implementation phase of trialing a weekend service?
LOS		
Functional Independence Measure (FIM)		
Australasian Rehabilitation Outcomes Centre (AROC) data		
Modified Barthel Index		
Patient QOL measure		
Patient/Family/Staff satisfaction measures		
Usual workforce statistics		

Other (please specify)

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Weekend Allied Health Therapy Service Provision in Rehabilitation

Barriers and Future Planning

22. What are barriers to your rehabilitation unit providing a weekend service?

- [ ] Budgetary constraints
- [ ] Organisational support
- [ ] Lack of evidence
- [ ] Lack of benefits to patients
- [ ] Patient safety
- [ ] Patient participation/motivation
- [ ] Patient fatigue
- [ ] Interference with patient leave or visiting hours
- [ ] Family/visitor preference
- [ ] Lack of patients, or lack of appropriate patients
- [ ] Staff resistance
- [ ] Staffing availability
- [ ] Staff safety
- [ ] Other (please specify)

23. What do you feel would be required to facilitate a weekend therapy service at your rehabilitation unit?

- [ ] Organisational support
- [ ] Staff support
- [ ] Medical staff support
- [ ] Other/further details
- [ ] Evidence of outcomes
- [ ] Patient/family satisfaction
- [ ] Financial support
- [ ] Staff availability
- [ ] Porterage availability
- [ ] Proximity of therapy area to ward

24. Have you implemented a weekend service in your rehabilitation facility in the past?

- ( ) Yes
- ( ) No

If yes, why are you no longer providing a weekend service?

25. Are you planning to implement a weekend service in the future?

- ◯ Yes
- ◯ No

If yes, when do you anticipate this will be implemented?

26. Would you consider providing a weekend therapy service at your facility?

- ◯ Yes
- ◯ No
- ◯ Unsure
- ◯ Why?

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Weekend Allied Health Therapy Service Provision in Rehabilitation

Clinical Perceptions of Weekend Service Provision in Rehabilitation

27. Do you feel that providing a weekend therapy service in rehabilitation is beneficial?

- ◯ Yes
- ◯ No
- ◯ Unsure

Why?

28. Please respond to these statements with your personal perspective

	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
Weekend therapy in rehabilitation is an effective method to increase intensity of practice	○	○	○	○	○
Weekend therapy provision in rehabilitation should be multidisciplinary	○	○	○	○	○
Weekend therapy provision will **not** lead to reductions in average length of stay	○	○	○	○	○
Weekend therapy provision will achieve faster goal attainment	○	○	○	○	○
Weekend therapy will increase patient activity	○	○	○	○	○
Weekend therapy will **not** lead to improved QOL for patients	○	○	○	○	○
Weekend therapy will **not** interfere with patient/family/visitor time	○	○	○	○	○
Weekend therapy will **not** facilitate family practice	○	○	○	○	○
Weekend therapy reduces slip-back of progress over the weekend	○	○	○	○	○
Weekend therapy will **not** enable increased admissions to the rehabilitation unit on a weekend	○	○	○	○	○
Weekend therapy services are safe for patients	○	○	○	○	○
Weekend therapy is **not** an effective use of staff resources	○	○	○	○	○
Weekend therapy provision will effect the setting of discharge dates	○	○	○	○	○
Weekend therapy services should be staffed by current rehabilitation staff members	○	○	○	○	○
I am satisfied with the current weekend service at my facility	○	○	○	○	○

Comments

29. What other methods do you use at your rehabilitation unit to increase intensity of practice?

30. What methods would you prefer to use, other than weekend therapy, to increase intensity of practice?

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Weekend Allied Health Therapy Service Provision in Rehabilitation

Survey Summary

31. If you would like a summary of the results sent to you, please enter your email address below.

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Weekend Allied Health Therapy Service Provision in Rehabilitation

Survey Completed

Thank you for your time and interest.

Appendix 3a – A pragmatic implementation of a 6-day physiotherapy service in a mixed patient rehabilitation unit

To access journal article, please see link:

https://www.tandfonline.com/eprint/MJttMsdsXZrjpy8qa5gW/full

Appendix 3b – The impact of staffing model in a 6-day rehabilitation physiotherapy service

To access journal article, please see link:

http://dx.doi.org/10.1002/pri.1701

Appendix 3c – Implementing a 6-day physiotherapy service in rehabilitation: exploring staff perceptions

To access journal article, please see link:

https://www.publish.csiro.au/AH/AH17107

Appendix 3d – Allied health weekend service provision in Australian rehabilitation units

To access journal article, please see link:

https://onlinelibrary.wiley.com/doi/10.1111/ajag.12500

Appendix 4 – Rehabilitation overheads for control and intervention groups

Itemised overheads	Control Group (Nov 2015-March 2016)	Intervention Group (Oct 2016-March 2017)
Ward expenses		
Housekeeping Supplies	$5,896	$5,475
Laundry Supplies	$37,160	$36,436
Printing & Stationery	$3,204	$5,677
Property Expenses	$9,940	$20,009
Marketing & Entertainment	$1,007	$0
Catering - Functions	$4,399	$2,633
Hospital overhead allocated to ward (0.82%)		
Hospital Contractor Services	$7,366	$7,145
Rates & Body Corporate	$1,280	$1,313
Utilities	$7,354	$6,755
Finance & Accounting	$309	$344
Insurance	$3,233	$3,436
Ward overheads	$81,147	$89,223
Intervention overheads*	$1,932	$2,176

*2.4% of ward overheads were allocated to the intervention, because the intervention consumed 4/168 hrs per week

Appendix 5 – Staffing costs for Saturday service for control and intervention groups

Staffing costs for Saturday Service	Control Group (Nov 2015-March 2016)	Intervention Group (Oct 2016-March 2017)
Physiotherapy (base rate)	$45.32	$46.46
Casual loading 25%	$11.33	$11.62
Hospital overheads 30%	$13.60	$13.94
Saturday loading 50%	$22.66	$23.23
Total per hour	$92.91	$95.24
Cost per week		
3.5 hours/week in control group	$325.17	
4 hours/week in intervention group		$381
Cost for 20 weeks	$6,503.42	$7,619
Registered Nurse for porterage (base rate)	$45.02	N/A
Casual loading 25%	$11.26	
Hospital overheads 30%	$13.60	
Saturday loading 50%	$22.66	
Cost per hour	$92.53	
Cost per week (2hours per week)	$185.06	
Cost for 20 weeks	$3,701.24	
Occupational therapist (base rate)	N/A	$46.46
Casual Loading 25%		$11.62
Hospital overheads 30%		$13.94
Saturday loading 50%		$23.23
Cost per hour		$95.24
Cost per week (4 hours per week)		$381
Cost for 20 weeks		$7,619
Allied Health Assistant (base rate)	N/A	$28.00
Casual loading 25%		$7.00
Hospital overheads 30%		$8.40
Saturday loading 50%		$14.00
Cost per hour		$57.40
Cost per week (4 hours per week)		$229.60
Cost for 20 weeks		$4,592.00
Operating costs	*$1,932.08*	$2,176.18
Total cost	$12,136.74	$22,007.06

N/A = not applicable